


2021 IEEE HAC /SIGHT Covid-19 Project

# Smart waste management for Covid -19 related primary health care centers and villages in remote areas

  
28/04/2021  
Banjara Hills, Road No. 3,  
HYDERABAD-500 034.(T.S.)

downs. It has completed 21 laps in 4 hours of drive on the off road mud terrain. Most of the other vehicles have failed to finish endurance due to their vehicle break downs. Maximum no. of laps completed by the winner team is 28 laps. The factors that have contributed in the success of Endurance test are vehicle sturdy design, low weight, driving skills and fitness of the driver. Team spirit, hard work and persistence helped us to achieve the favorable results. Valedictory function was conducted in the afternoon, where in winner and runner teams have received their prizes. In the evening team has packed the vehicle and tools in the truck and sent back to the College.

### **Final Results:**

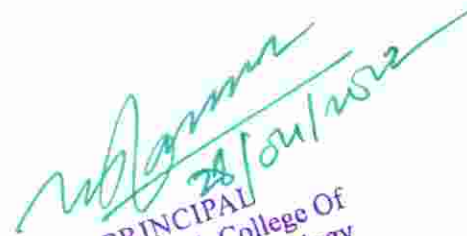
MJCET team stands at **7<sup>th</sup> rank** in the final endurance test nationwide and achieves **1<sup>st</sup> rank** in Telangana and Andhra Pradesh States in the overall ranking.

### **Recruitment drive:**

Five students of MJCET are short listed in the aptitude test and psychometric test. Technical and HR interviews are conducted on 27<sup>th</sup> and 28<sup>th</sup> January 2020. Two students are selected in the recruitment by reputed automobile companies at SAE – BAJA 2020 conventions, like Anand Motors and ARAI, Pune.

### **Funding:**

MJCET management has sanctioned a fund of Rs. 60,000/- in the month of September 2019. The fund is used for the vehicle fabrication and transportation.

  
28/01/2020  
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## Summary

In order to deal with the COVID-19 pandemic, State and Central Governments, several NGOs have initiated various steps, which include setting up quarantine centers/camps, Isolation wards, sample collection centers, and laboratories. Following specific guidelines for the management of waste generated during diagnostics and treatment of COVID-19 suspected/confirmed patients, are required to be followed by all the stakeholders including isolation wards, quarantine centers, sample collection centers, laboratories, and common biomedical waste treatment and disposal facilities, in addition to existing practices under BMW Management Rules, 2016. These guidelines are based on current knowledge on COVID-19 and existing practices in the management of infectious waste generated in hospitals while treating viral and other contagious diseases like HIV, H1N1, etc. The lack of proper infectious healthcare waste management in rural areas and villages in India has been a chronic issue that is greatly magnified during Covid epidemics necessitating lockdowns, quarantine, and severe travel restrictions along with a lack of healthcare providers. Lack of sanitation, clean water supply, and medical supplies including personal protective equipment makes the situation worse in rural villages in India. Our proposed project consists of deploying smart medical waste management leveraging IOT, Sensors, and autoclaving technology.

## Project Overview

COVID-19 rural healthcare center waste management system for hospitals and primary healthcare centers, Rural village panchayats/Municipal offices involved in COVID Waste management ensures preparedness (Representation figure) to deal with infectious waste in case of positive detection at a facility or among patients who recently visited the facility.

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### Who are the stakeholders and how will they be engaged in the project?\*

**Stakeholder:** *An individual, group of people or organization that affects or is affected by an intervention. The stakeholders should include the project team, the beneficiary community, and any others that will experience relevant and significant outcomes (intended or unintended, positive or negative). Examples include local governments, non-governmental organizations, service providers, institutions such as schools or hospitals, and so on.*

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The list below identifies the project stakeholders and how they are engaged in the project:

- DNA Research Centre in association with IEEE Hyderabad section will enable the selection of 3 rural healthcare centers (2 Primary healthcare centers and one self-isolation ward)
- Sanitation staff and primary waste management officials will be trained to use the system.
- Appropriate vendors will be reached out by the Principal investigator of the project in consultation with Scientists/ associates of the DNA Research Centre.
- 01-03 people will be selected and trained by the DNA Research center in their lab to help in the start phase of the projects.

- Cooperation and support of local Gram-Pradhan (Political head of Villages) will be ensured by the SIGHT Hyderabad team. If needed the team will visit the rural areas/Village Councils.
- Only those primary healthcare centers will be preferred who are ready to sustain the facilities after the completion of this project establishment.
- DNA Research center will help those primary healthcare centers to scale the facility and maintenance for 1 year.

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## Technology Used

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Retroreflective Sensing - To detect the presence or absence of objects, the light beam path is directed across the detection path so that the interrupted light beam will detect the passing opaque/transparent objects. When the light beam is broken or when the intensity of the received light beam is reduced below a threshold level, the sensor responds by switching its output. Its unique dual-lens system or bifurcated fiber optic light guide establishes the transmitted light beam path and the returned light beam path on the same axis.

Detection of objects can only be reliable and guaranteed even involving all sensitive conditions if both components are optimally coordinated with one another.

Autoclaving - Autoclaving is used to decontaminate certain biological waste and sterilize media, instruments, and labware. Regulated medical waste that might contain bacteria, viruses and other biological material is recommended to be inactivated by autoclaving before disposal. Autoclaving kills microbes by hydrolysis and coagulation of cellular proteins, which is efficiently achieved by intense heat in the presence of water. The intense heat comes from the steam. Pressurized steam has a high latent heat; at 100°C it holds 7 times more heat than water at the same temperature. The extra pressure in an autoclave means that water boils at a temperature higher than its normal boiling point—roughly 20°C hotter—so it holds and carries more heat and kills microbes more effectively.

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## Project plan and execution - Methodology

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The operator of waste management shall ensure regular sanitization of workers involved in handling and collection of biomedical waste; - Workers shall be provided with adequate PPEs including three-layer masks, splash-proof aprons/gowns, nitrile gloves, gumboots, and safety goggles; - Use the dedicated vehicle to collect COVID-19 ward waste.

Duties of Urban Local Bodies - Urban Local Bodies are responsible for ensuring safe collection and disposal of biomedical waste if any, generated from Quarantine Camps/ Quarantine Homes/ Home Care for COVID-19 suspected persons.

Waste handlers must be given basic/elementary training by ULBs/Villages with help from NGOs Hand hygiene, Respiratory etiquettes, social distancing, Use of PPEs and their disposal, and screening clinics via videos and practical demonstrations in the local language.

Our project plans to establish the operations initially for 3 health care centers with the help and collaboration of Local authorities into their health centers. All the standardization will be completed at the Waste management

The project schedule is as follows:

- Week 1: Discuss with Remote areas/villages and procure Waste management kits (3 sets, one for each center)
- Week 1 to 3: Selection of Hospital/Rural staff waste management team in collaboration with DNA Research center the partner NGO.
- Week 4 to 6: Training of Garbage management staffs by DNA Research center, Hyderabad at the rural healthcare/village hospital site
- Week 7 to 8: Trial Runs of equipment and readiness of waste management facilities, evaluation, and treatment.
- Week 9 -12: Evaluation of operations – evaluate and measure operations
  - Benefits in handling waste management: Pre-installation vs Post-installation
  - Reliability of System performance and maintenance
- • End of Week 12 – Evaluation on completeness of centers if they are operational.

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## Usage

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To cope with the COVID-19 pandemic, state and central governments, as well as numerous non-governmental organizations (NGOs), have implemented a variety of measures, including the establishment of quarantine centers/camps, isolation wards, sample series facilities, and laboratories. All stakeholders, including isolation wards, quarantine facilities, sample collection facilities, laboratories, and commonplace biopharmaceutical waste remedy and disposal facilities, are required to observe the following unique hints for waste control engendered at some point of diagnostics and treatment of COVID-19 suspected/revealed patients, in addition to current procedures under BMW Management Rules, 2016. These conclusions are based on cutting-edge information on COVID-19 and management typically involved in the management of infectious waste produced in health care facilities whilst also treating viral and other contagious chronic conditions such as HIV, H1N1, and others. The lack of proper infectious healthcare waste management in rural areas and villages in India has been a persistent problem, which is exacerbated at some point in Covid epidemics, necessitating lockdowns, quarantine, and severe travel restrictions, as well as a lack of healthcare carriers. The state of affairs in rural villages in India is deteriorating due to a lack of sanitation, a smooth supply of water, and scientific elements such as residential insulating appliances. Our proposed challenge entails dispatching ingenious scientific waste - management techniques that make use of IoT, sensors, and carbonization and activation technology.

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## Benefits

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- A reduction of up to 80% in the number of waste collections required, resulting in less manpower, emissions, fuel use, and traffic congestion.
- A reduction in the number of waste bins needed
- Analytics data to manage collection routes and the placement of bins more effectively
- Improved environment (i.e. no overflowing bins and less unpleasant odors)
- Smart sensors determine the fullness level of waste containers
- Eliminating the cost of unnecessary collections
- Remote diagnosis with hardly any correspondence required
- Thorough disinfecting of global epidemic waste obtained which enables health personnel in conveniently disposing of waste and promoting greater infection prevention constraints
- Identifying cost-effective routes
- Improving process efficiency
- Environment-friendly

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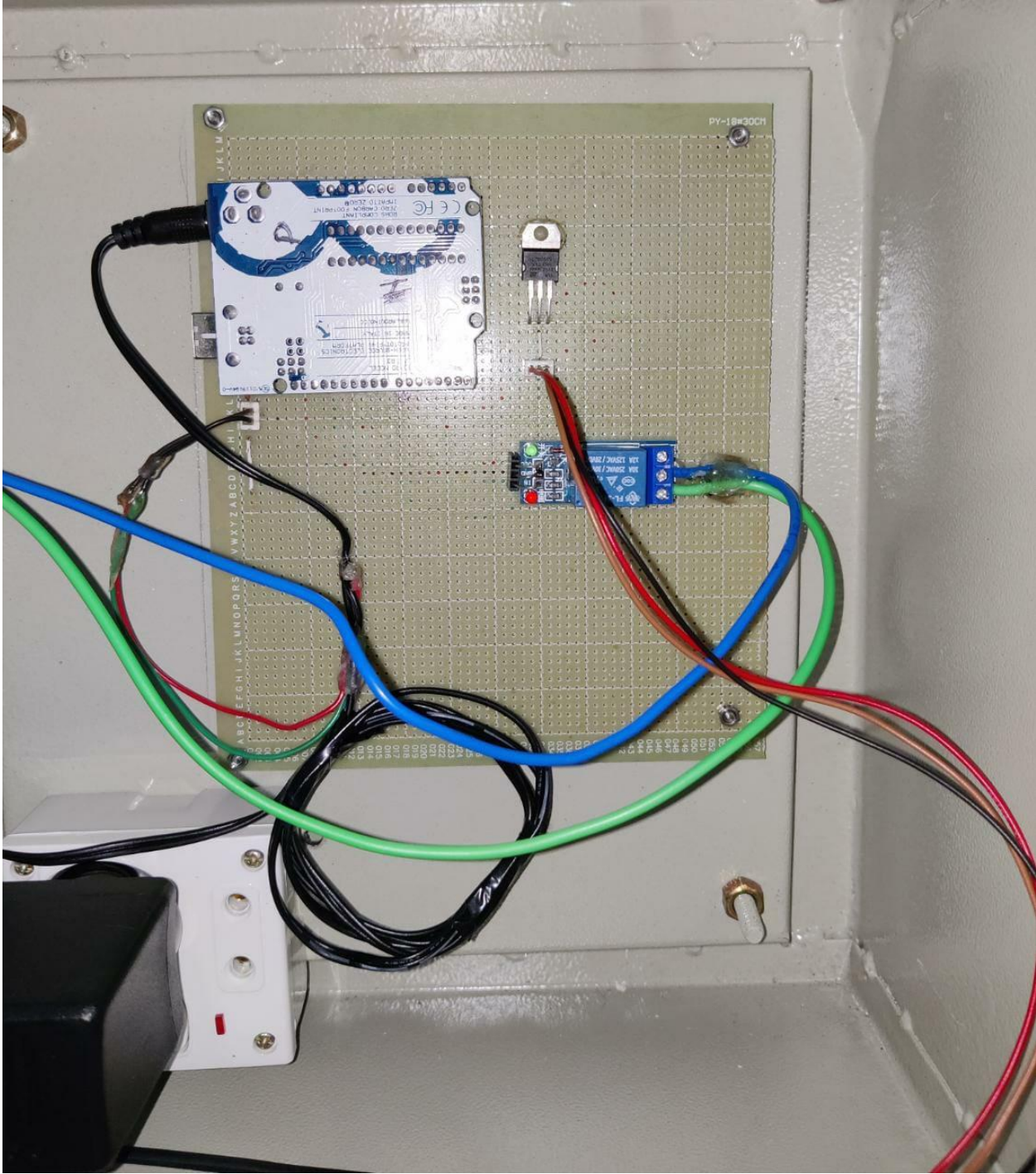
## Circuit Implementation

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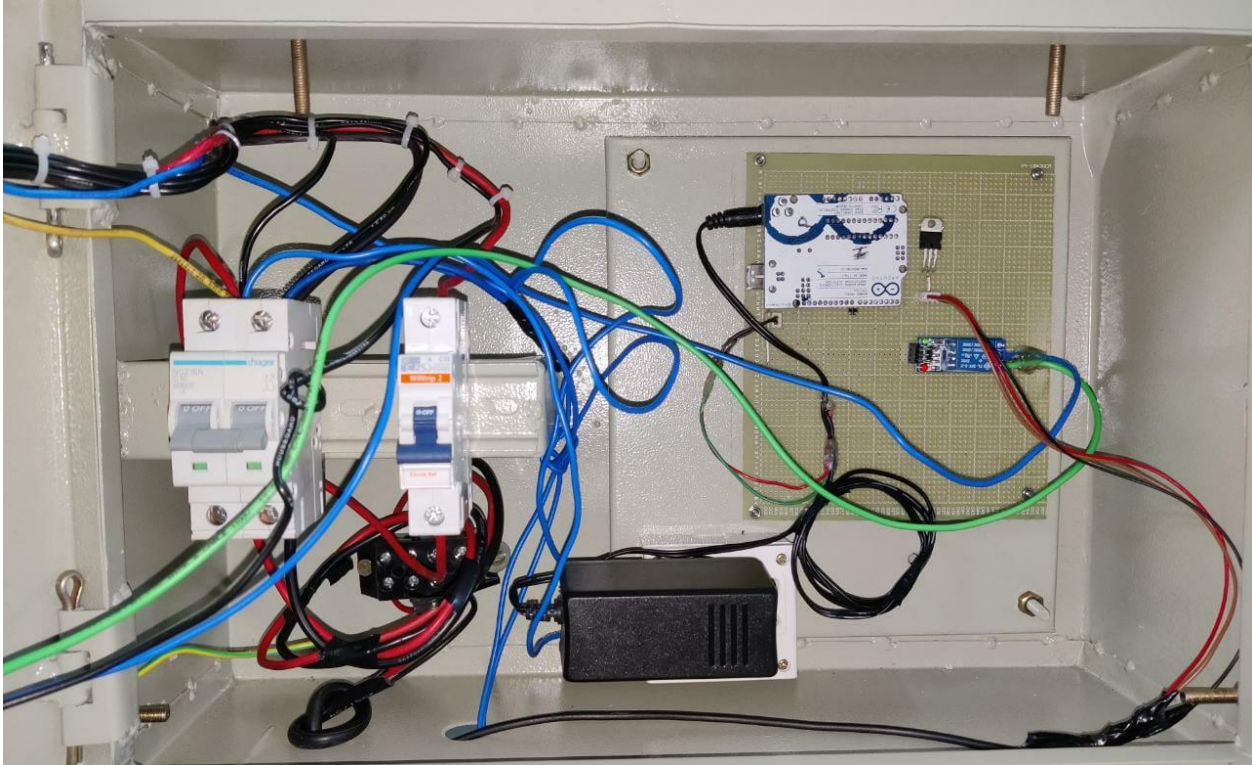
### Material Transfer Flat Belt Conveyor Machine -



Retro Reflexive Sensor Circuit -



Solid State Relay Wiring with Proximity Sensor/Switch and AC Load

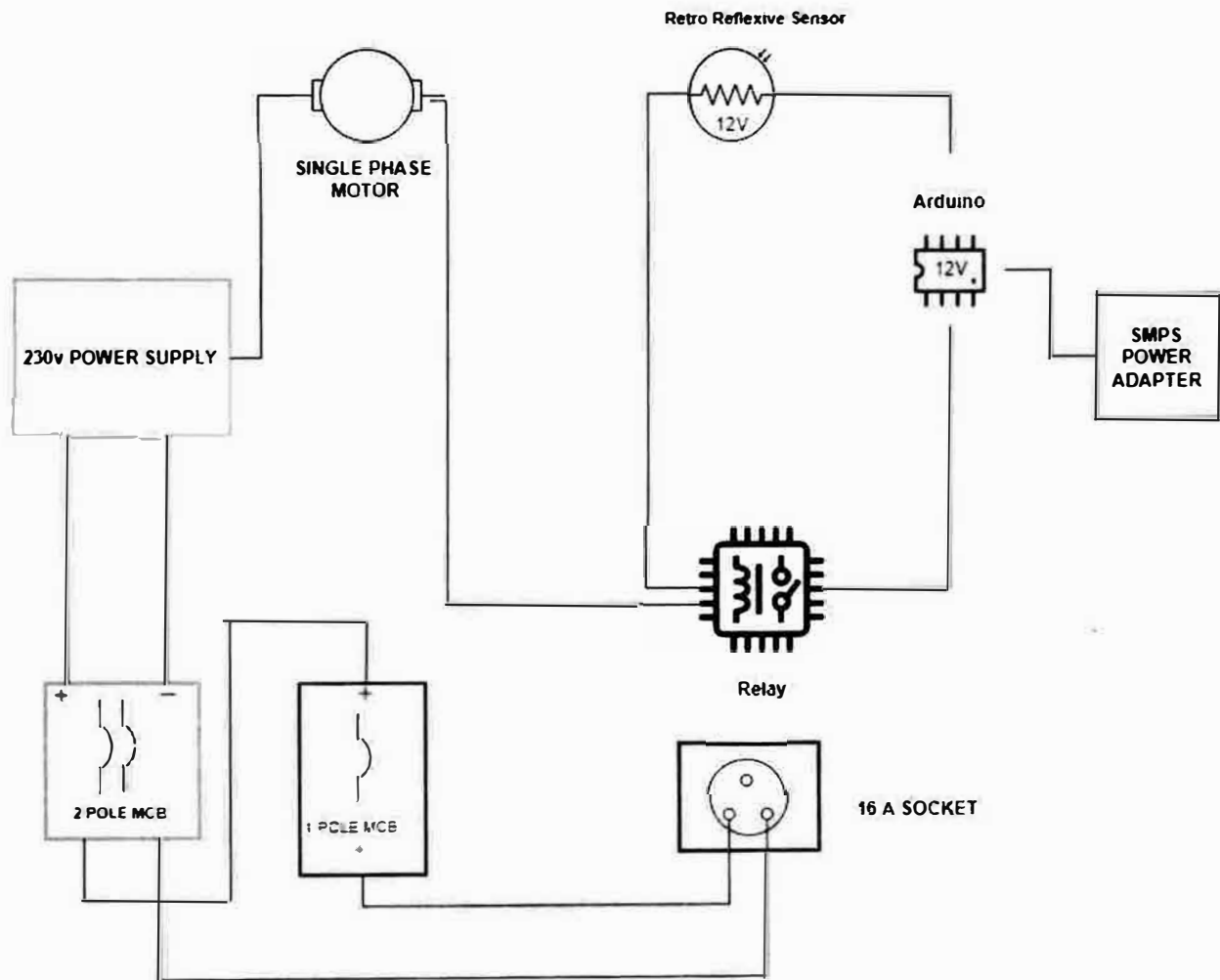




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## Circuit Implementation Process

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CIRCUIT DIAGRAM

*[Handwritten Signature]*  
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# MUFFAKHAM JAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(SULTAN UL ULOOM EDUCATION SOCIETY)

Mount Pleasant, 8-2-249 to 267,

Road No – 3, Banjara Hills

Hyderabad – 500034,

Telangana State, India

A Report on

SOLAR POWERED SPINING WHEEL

(SOLAR CHARKHA)

NATURE EMPOWERS TECHNOLOGY FOR BETTER LIVING

PATENT REF NO.: 319528

DATE OF ISSUE: 30-08-2019

DURATION: 20 YEARS

PATENT GRANTED BY: GOVT. OF INDIA

Technology Developed by

R & D Cell

Mechanical Engineering Department

  
ADVISOR-CUM-DIRECTOR  
Muffakham Jah College of  
Engineering & Technology  
Road No:3, Banjara Hills,  
Hyderabad-500 034. T.S. .



**INTELLECTUAL  
PROPERTY INDIA**  
PATENTS | DESIGNS | TRADE MARKS  
GEOGRAPHICAL INDICATIONS



भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Rule 74 Of The Patents Rules)

क्रमांक : 044113145  
SL No :



पेटेंट नं. / Patent No. : 319528  
 आवेदन नं. / Application No. : 5250/CHE/2014  
 प्रस्तुत करने की तारीख / Date of Filing : 21/10/2014  
 पेटेण्टी / Patentee : MUFFAKHAM JAH COLLEGE OF ENGINEERING & TECHNOLOGY

प्रमाणित किया जाता है कि पेटेंटों को उपरोक्त आवेदन में उल्लेखित SOLAR POWERED SPINNING WHEEL नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार जान तारीख 21st day of October 2014 से बीस वर्ष की अवधि के लिए पेटेंट अनुदान किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled SOLAR POWERED SPINNING WHEEL as disclosed in the above mentioned application for the term of 20 years from the 21st day of October 2014 in accordance with the provisions of the Patents Act, 1970.



अनुदान की तारीख : 30/06/2019  
Date of Grant

पेटेंट नियंत्रक  
Controller of Patent

टिप्पणी - इस पेटेंट के परीक्षण के लिए वार्षिक शुल्क 21st day of October 2018 को और उसके बाद प्रत्येक वर्ष से उचित दिन देना होगा।  
Note - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 21st day of October 2018 and on the same day in every year thereafter

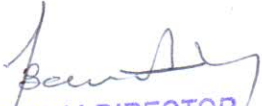
*Bela Ah*  
ADVISOR-CUM-DIRECTOR  
Muffakham Jah College of  
Engineering & Technology  
Road No:3, Banjara Hills,  
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### **Profile of the Institute:**

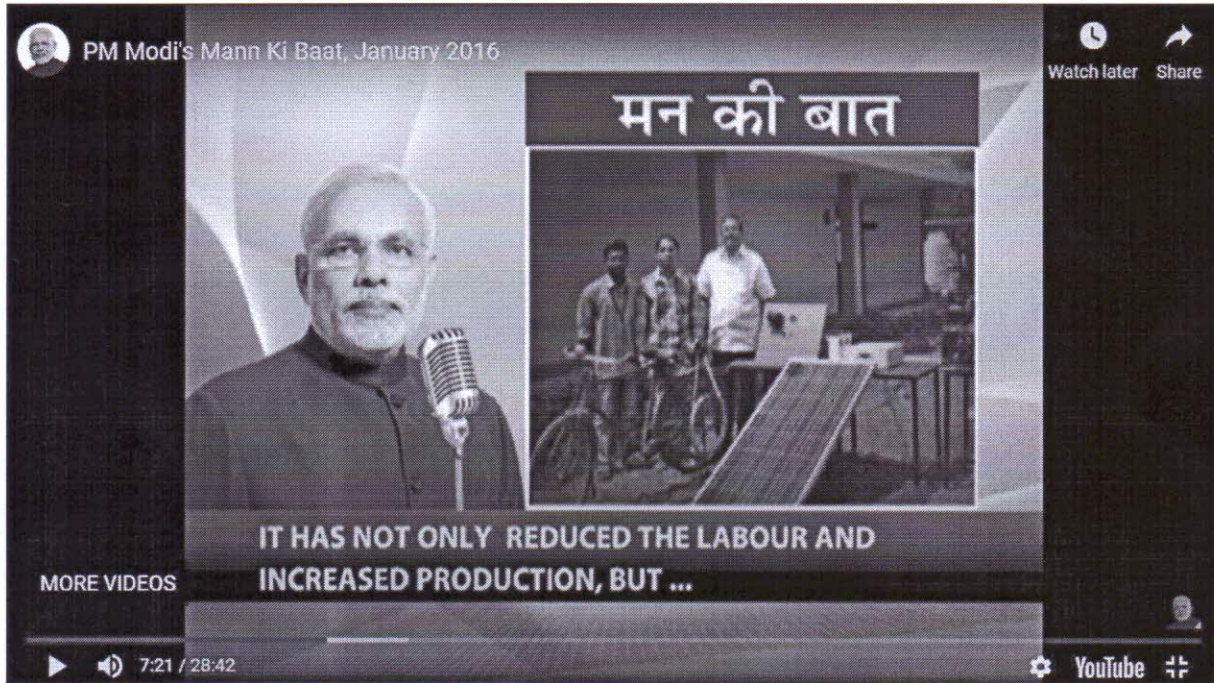
MJCET is the premier institute that has been imparting quality education for more than four decades. The institute is centrally located in the heart of the Hyderabad city with lavish green nature filled atmosphere in the campus. Institute is well-built with state of art laboratories, infrastructure. Most importantly, institute boards of highly qualified faculty and among them more than sixty are Doctorates. MJCET is affiliated to Osmania University and offer UG and PG programs in various Engineering streams. Three of the departments are recognized by Osmania University as research centers. They provide R & D facilities to research scholars and guide them to pursue doctoral studies. Research centers under take various research activities to serve the society and promote research culture among the staff.

### **About Conventional Charkha Operation:**

It is a hand operated machine that is used to make thread from cotton. Machine operation is sensitive work which involves great deal of human effort and care. Khadi Society, Handloom Society and Cottage Industries across rural sectors are engaged in this profession. Large number of people including women, senior citizen and physically challenged persons work in this profession to meet their daily earnings. Manual machine operation for long duration causes fatigue and pain to workers. Machine spinning is required to be performed carefully. Any abrupt and irregular manual spinning causes thread breakage, knots in thread and wastage of cotton.

  
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Source of Inspiration:

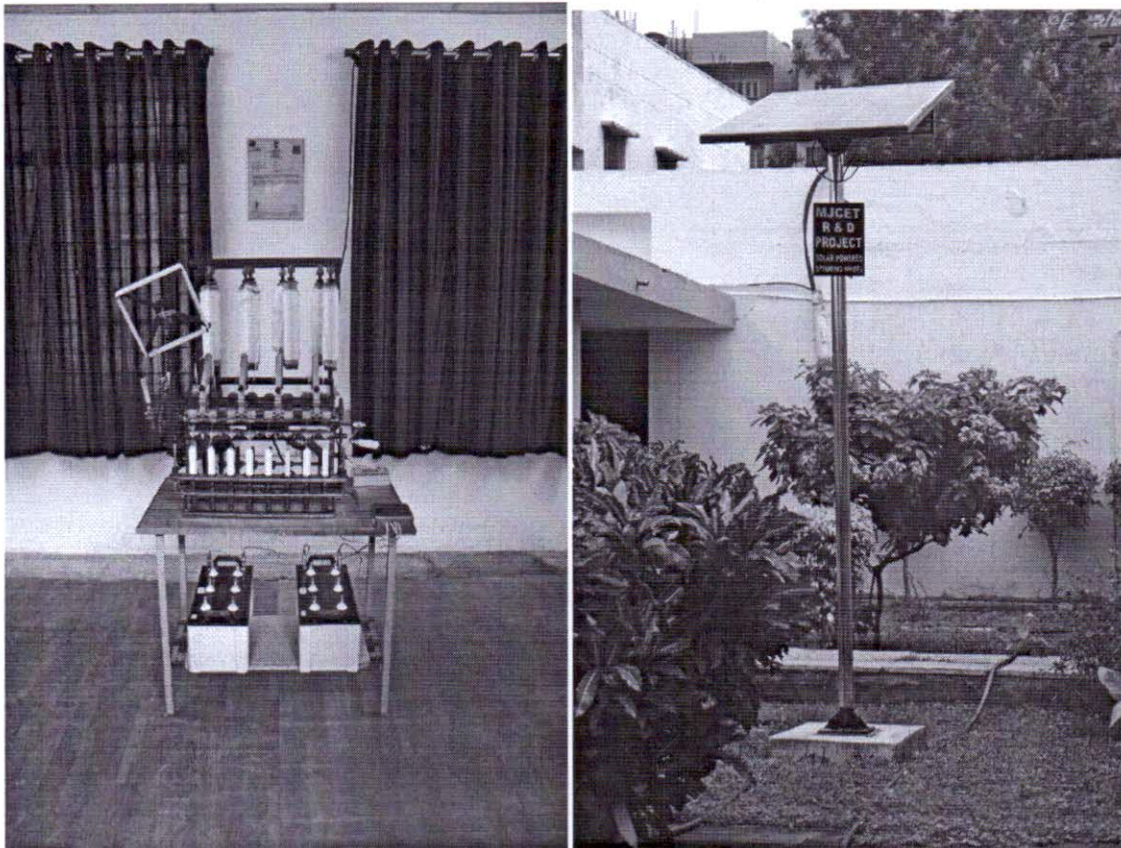


The project was discussed by our Honourable Prime Minister Shri Narendra Modi in “Mann Ki Baat” which was streamed live on 31st January 2016.

R & D center of Mechanical Engineering Department, MJCET have developed and retrofitted hand operated Charkha machine with solar power operated system that minimizes human effort, improve thread quality with minimum wastage of cotton and enhance productivity and earnings. This project has been granted patent rights for 20 years by the Government of India.

  
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### Technical Details of Solar Charkha:



The Components involved in retro-fitting of conventional charkha into solar powered spinning wheel are: Solar panel, DC motor, Speed regulator, solar charge controller and Solar batteries. Solar panel is installed outside to harvest the electric energy from sun light. Solar batteries are used to store the energy and supply the same during the night times and in poor day light situations. DC motor supplies smooth and uniform drive to the charkha. Variable speed control device is used to regulate the machine speed. Belt and pulleys are used for power transmission. Solar charge controller device is used to distribute the electrical power to motor from battery and solar panel. The machine can be fitted with LED lights to work in the night times.


  
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### **Main Features of Solar Charkha:**

Charkha is fully operated with solar power at free of energy charges. Solar power system can support uninterrupted 24 hours of power supply to the machine. DC motor provides smooth and uniform machine operation. Varieties of thread sizes are made using variable speed drive. Solar power system supports the additional stand by machines. The main benefits are Human efforts are substituted with solar power. Productivity and earnings are enhanced. Thread quality is improved with minimum wastage of cotton.

### **Future scope of the Solar power Charkha:**

- In the current work, solar power system is established on standalone charkha machine. In case of mass production, group of machines can be operated by a single source of solar power system of suitable capacity. This will substantially minimize the initial setup cost.
  
- In the current work, solar energy is stored in solar batteries in order to utilize the same for machine operation during night times. In case of mass production, large numbers of batteries are required to store huge amount of solar energy. Instead of battery storage, the solar power system can be connected to grid interface. Thus, it facilitates supply of surplus energy to the grid and draws the same for machine operation. Thus batteries storage can be avoided.

  
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**Support Required for patented Solar Charkha Project:**

Solar Charkha that is developed by R & D cell, MJCET will be greatly useful to Khadi Society, Handloom Industry and Cottage Industries to improve their productivity and to make fine quality thread with minimum wastage of cotton. Solar Charkha relieves physical strain and fatigue of the operator by substituting human effort with solar power.

Marching towards fulfillment of our social responsibility, we are committed to make the technology useful to the individuals and the society. In this regard, we humbly seek your attention and favor for technology transfer along with patent rights at reasonable price to the potential stake holders or to work with concerned authorities in NITI Aayog, Department of Commerce, National Research Development Corporation (NRDC), Government of India or any of your recognized vendors who would like to partner with us in the mutual interest of social responsibility.

***Contact Details:***

- 1. Dr. Basheer Ahmed, Advisor-cum-Director,**  
Email: director@mjcollege.ac.in, Phone No.: 9849455423
- 2. Dr. Mohd. Viqar Mohiuddin, Professor**  
Email: mdviqar@mjcollege.ac.in, Phone No.: 9492039782
- 3. Dr. D. Srinivas Rao, Professor**  
Email: dsrinivasrao@mjcollege.ac.in, Phone No.: 9866378940

  
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## **MUFFAKAM JAH COLLEGE OF ENGINEERING.**

### **Mechanical Engineering Department**

#### **Report on SAE – MJCET Team participation in SAE – BAJA 2020 Competitions.**

SAE-India is India's leading resource for mobility technology and BAJA is a flag ship event of it . Over the years, BAJA has grown in popularity and has become a bigger event nationally. It serves as a platform for young Engineering students to showcase their talent, skills and acquire a real time experience while over coming obstacle and challenges. The 13<sup>th</sup> edition of BAJA SAE-2020 is different scenario in terms of the level of vehicles, testing tracks and competitions. The event is organized at NATRAX, Peethampur, Indore, MP state during 22<sup>nd</sup> – 26<sup>th</sup> January 2020. Team MJCET participated in the event and the details are reported as follows..

#### **Virtual BAJA (Pre selection) :**

In the month of July 2019, MJCET team has prepared a detailed design report and appeared for virtual BAJA selections at CHITKARA UNIVERSITY, PUNJAB. The team has cleared aptitude and technical tests and presented design report. The team got short listed. Team has then registered for main BAJA 2020 conventions.

#### **Vehicle fabrication:**

Team has fabricated the ALL TERRAIN VEHICLE in three months. They have procured engine from Briggs & Stratton, CVT and differential gear box from OEM supplier in Pune. Fox suspension shock absorbers are purchased from BITS Pilani and IIT Rurkee. The tyres and Aluminum rims are procured from dealer. Roll cage is fabricated in welding section of our College using TIG welding process. Components like driving shafts, knuckles, hubs, steering rack and pinion are machined at outsource. Other parts are manufactured in-house. Driver's safety suit, transponder and other items are used from the available inventory. All the component assembly, body works and painting are carried out in the SAE laboratory. The vehicle is tested in the college campus for about two weeks. Vehicle un-veiling and flag off was organized on 10<sup>th</sup> January 2020 and vehicle got dispatched by road transport on 18<sup>th</sup> January 2020. The team has reached at the conventions and registered for the competitions. Total of 176 teams have registered for M – BAJA and E – BAJA categories.

### **Technical Inspection:**

Team has prepared the vehicle and appeared for Technical Inspection, where in all parameters and specifications as per rule book are thoroughly inspected by the judges. Certain deviations were raised like CVT cover, brake caliper cover, battery box, CVT mounting bolt, drain pipe, accelerator pedal adjustment and engine speed governor adjustment, driver seat belt adjustment and fire wall gap adjustment. All these deviations were rectified by the team and the vehicle has successively cleared Technical Inspection and got certified. The vehicle net weight is measured to be 188.8 Kgs. MJCET team has taken 2 days to clear the Technical Inspection of their vehicle.

### **Static events:**

Team along with vehicle appeared for static events like cost evaluation, Design Evaluation and Marketing strategy Evaluation and scored well in these presentations. They could not appear for two events like go-green and innovation as they were not ready with content and missed those scores.

### **Brake test:**

Soon after completing Technical Inspection, team went for Brake test on 25<sup>th</sup> January 2020. All the wheels are not instantaneously locked in the brake test in the first two attempts. Brake fluid was leaking from pressure switches. Team rectified the leakages and performed bleeding of brake fluid and again presented the vehicle for brake test. Thus, vehicle and team cleared the brake test successfully in third attempt and got certified.

### **Dynamic events:**

After clearing the brake test, team has presented the vehicle for dynamic events like acceleration, maneuverability, suspension & tracks and rock crawl. Team could not participate in dynamic events, as the reporting time was over. This happened due to delay in clearing Technical Inspection and brake test. We missed the scores for Dynamic events.

### **Final Endurance:**

Final endurance test started on 26<sup>th</sup> January 2020 after National flag hoisted. Total of 76 teams are qualified and lined up their vehicles. Final endurance test has lasted for 4 hrs from 10AM to 2PM. Our vehicle has completed the race till the end without any brake-

downs. It has completed 21 laps in 4 hours of drive on the off road mud terrain. Most of the other vehicles have failed to finish endurance due to their vehicle break downs. Maximum no. of laps completed by the winner team is 28 laps. The factors that have contributed in the success of Endurance test are vehicle sturdy design, low weight, driving skills and fitness of the driver. Team spirit, hard work and persistence helped us to achieve the favorable results. Valedictory function was conducted in the afternoon, where in winner and runner teams have received their prizes. In the evening team has packed the vehicle and tools in the truck and sent back to the College.

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### **Funding:**

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**A REPORT  
ON  
FABRICATION OF ROBOSOCCER BOTS**

# TABLE OF CONTENTS-

SNO	PARTICULARS
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7	TRY ROBOT PROGRAM
8	ROS

## INTRODUCTION

Initially a part of Robotics Centre MJCET, Team Robocon branched out with a singular purpose in mind, to build the ultimate showstopper and win the annual Robocon Asia-Pacific competition, and slowly but surely, we get ever so close to our goal.

Every year we build robots, participate in various competitions all over India, and amass vast reserves of knowledge that we tap into to build not just our club and our dream, but also ourselves as people.

Although still in its infancy, TRM has risen above the ranks of the different clubs in MJCET and now stands as one of the most prestigious and elite clubs of the institution. The tough selection process is well known in the college and helps in hand picking the people with the most potential and grooming them into becoming disciplined and valuable members of the society.

## REQUISITION FORM

05/03/2020

1. Name of the Institution : ***Muffakham Jah College of Engineering & Technology***
2. Department : ***Electronics & Communication Engineering Dept.***
3. Proposal (Details) : **Fabrication of Robots for ROBOCON – 2020**
4. Approval of GC/BOG : ***Budget 2019 – 2020***
5. Estimated Amount  $\longrightarrow$  : **Rs.2,00,000/-**
6. Budget Provision : Regular Budget  
for the Year **2019 – 2020**

Head of Account	Recurring	Non – Recurring
	Students' Technical Activities	-

- (a) Budget Provided : **Rs. 15,00,000/-**
- (b) Amount Already Spent : **Rs. 8,84,000/-**
- (c) Balance Available : **Rs. 6,16,000/-**
- (d) Balance After Deducting : **Rs. 4,16,000/-**  
the Amount in Item No.5

7. **R E M A R K S** :
- The amount is required for fabrication of robots to participate in ROBOCON – 2020 to be held in IIT, Delhi.***

Name & Sign of Authority

Hon. Secretary  
Sultan-ul-Uloom Education Society

### CHECK LIST

1. Whether Any Advance Made If so, the Amount :
2. Amount to Be Paid as per Bill :
3. Balance left, if any after Full Payment :

Verified by

HEAD OF THE DEPT.

Accountant

A.A.O. (Accts.)

P R I N C I P A L

## **ABU-ROBOCON**

TRM has not forgotten its purpose and is currently working around the clock to make the TR and PR for the Robocon 2020 competition.

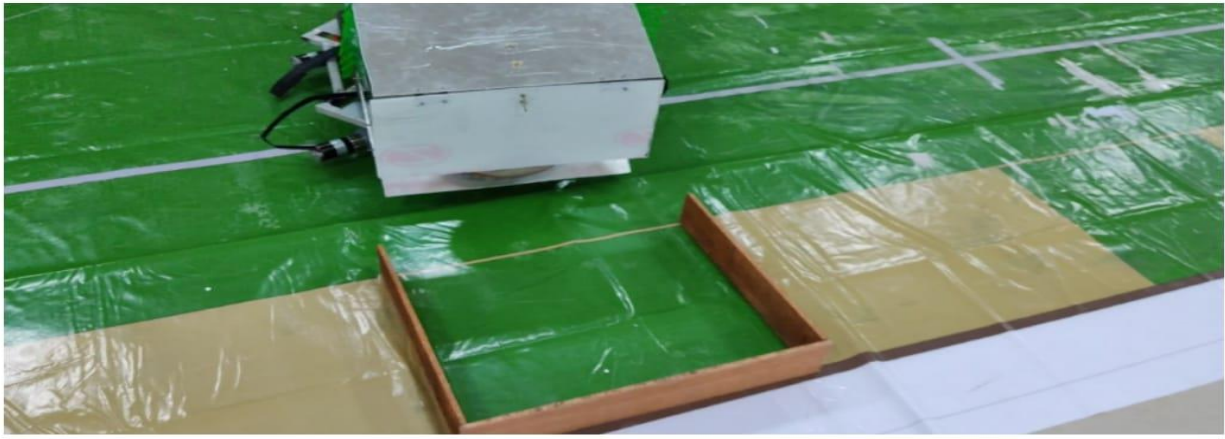
### **Theme ABU Robocon 2020**

The ABU ROBOCON 2020 Suva contest is to play rugby 7's game using two robots and five obstacles as five defending players. The highlight of this game is how the two robots collaborate to score Try and the Goal Kick. The main and unique challenge of this game will be Goal Kick, kicking the Kick Ball over the cross bar of the conversion post because of the unique shape of the rugby ball. The audience will be fascinated if the robot made all the Goals successfully.

### Brain storming and preparation of initial prototype:







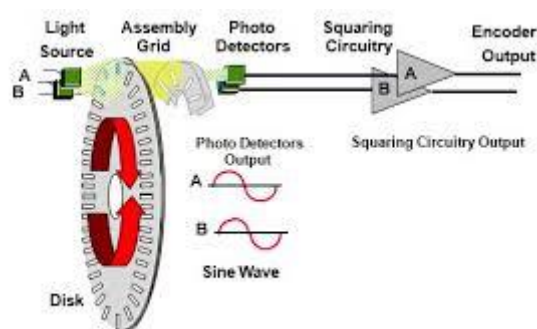
## Locomotion

The Pass Robot (**PR**) and the Try Robot (**TR**) share a common locomotive mechanism, known as the **Synergic Four Wheel Steering Drive**. This drive has superior maneuverability over other drives as all the wheels face the same direction at all times. Each of the four wheels are attached to a driving **Planetary Gear Motor** which is known for its low noise level, durability and high amount of torque provided. These 4 motors attached to the wheels provide the power behind the locomotion. All the wheel casings are attached to sprockets which are all connected together with a single chain link. The chain link is driven by a **Super Hercules Motor**. During translation, each wheel is powered individually to propel the robot while the direction of motion is controlled accurately by the **Super Hercules Motor** and this motor needs to rotate only for half of its complete rotation to move in any direction and be present in any orientation. This setup has minimal amount of loss, no wasted effort, maneuverable and powerful.

The locomotion of the **PR** is controlled through a PS2 controller which sends commands to the **Arduino Due** (Micro-Processor) and in return the Due issues commands to Hercules Motor Drivers which drive the locomotion motors to achieve the desired motion. In contrast to that, the kicking and passing tasks are done autonomously making the PR a semi-autonomous robot.

## Encoders

Encoder is a circuit or a network that acts like a feedback mechanism from motor. Encoders converts rotating motion of motor into an electrical signal which is taken as an input by a microcontroller as an analog signal and converts it into digital signal and from that signal readings are calculated via programming and for each rotation of motor an encoder gives fixed value of counts (say 1500) and based on this counts and wheel through the distance of the robot can be calculated.



### Encoder working principle

## MATLAB and SIMULINK

**MATLAB** is an abbreviation of "Matrix Laboratory" and is a multi-paradigm numerical computing environment and a non-free or closed-source software programming language developed by *MathWorks*.



MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.

Although MATLAB is intended primarily for numerical computing, an additional package, **Simulink**, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

**SIMULINK** is a MATLAB-based graphical programming environment for modeling, simulating and analyzing multidomain dynamical systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tight integration with the rest of the MATLAB environment and can either drive MATLAB or be scripted from it. Simulink is widely used in automatic control and digital signal processing for multidomain simulation and model-based design.

We designed our two robots: the **PR** (Pass Robot) and **TR**(Try Robot) in **SOLIDWORKS CAD** and used **Simscape Multibody Link** which enabled us to integrate our SOLIDWORKS CAD assemblies with electrical, hydraulic, control, and other systems, and simulate our entire system within the Simulink environment. A plug-in lets you export SOLIDWORKS CAD assemblies to an XML file and corresponding geometry files. Importing the XML file into MATLAB creates bodies using the geometry files and converts CAD mate definitions to joints. Simulation can be used to refine the requirements for your mechanical system and optimize system-level performance.

Simulation modeling solves real-world problems safely and efficiently. It provides an important method of analysis which is easily verified, communicated, and understood. Simulation modeling provides valuable solutions by giving clear insights into complex systems. It sheds light on the underlying mechanisms that control the behavior of a system. More practically, simulation can be used to predict (forecast) the future behavior of a system and determines what you can do to influence that future behavior.

It helped us to analyze the behavior of our pass robot and try robot. It gave us a virtual prototype and helped us to solve the minor problems that could have arose while implementing.

## **PS2 interfacing**

MR1 was controlled using ps2 controller. Different buttons were assigned for different tasks based on the requirement i.e., analog buttons for speed control and locomotion, pad buttons for other mechanisms controlling etc.

## WIRED PS2 CONTROLLER

A ps2 controller DualShock was used to control the Robot i.e., MR1.

The requirement was choosing a controller with good no. buttons which can be interfaced with our bot easily. And the Ps2 controller was one of the best things matching out requirements and is easily available in the market.



The very first task was interfacing the controller with a microcontroller so as to use it as we desired.

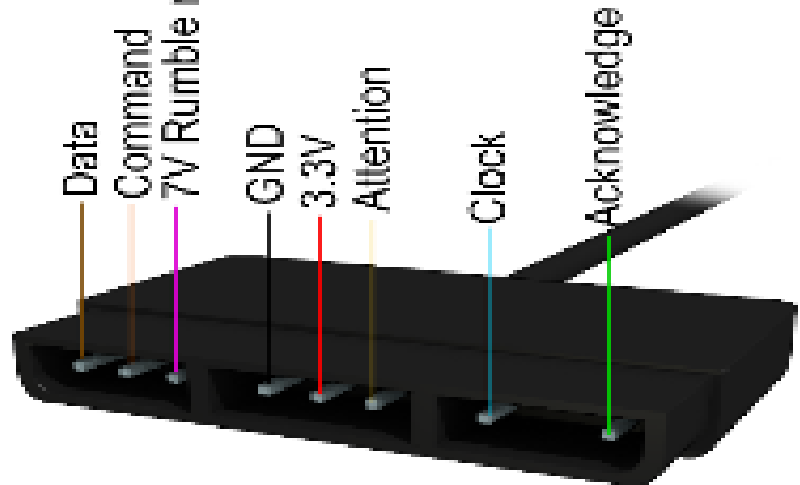
The microcontroller used is ATmega16 which is a 40 pin IC manufactured by ATMEL with 16KB of size for the program.

## INTERFACING WITH THE MICROCONTROLLER:

After a proper research on the PS2 joystick, it was found that the ps2 uses SPI communication to communicate with the microcontroller

The pin out of the PS2 controller comprises of 8pins. Namely,

- 1) Data
- 2) Command
- 3) Rumble Motor
- 4) Ground
- 5) VCC
- 6) Attention
- 7) Clock
- 8) Acknowledgement

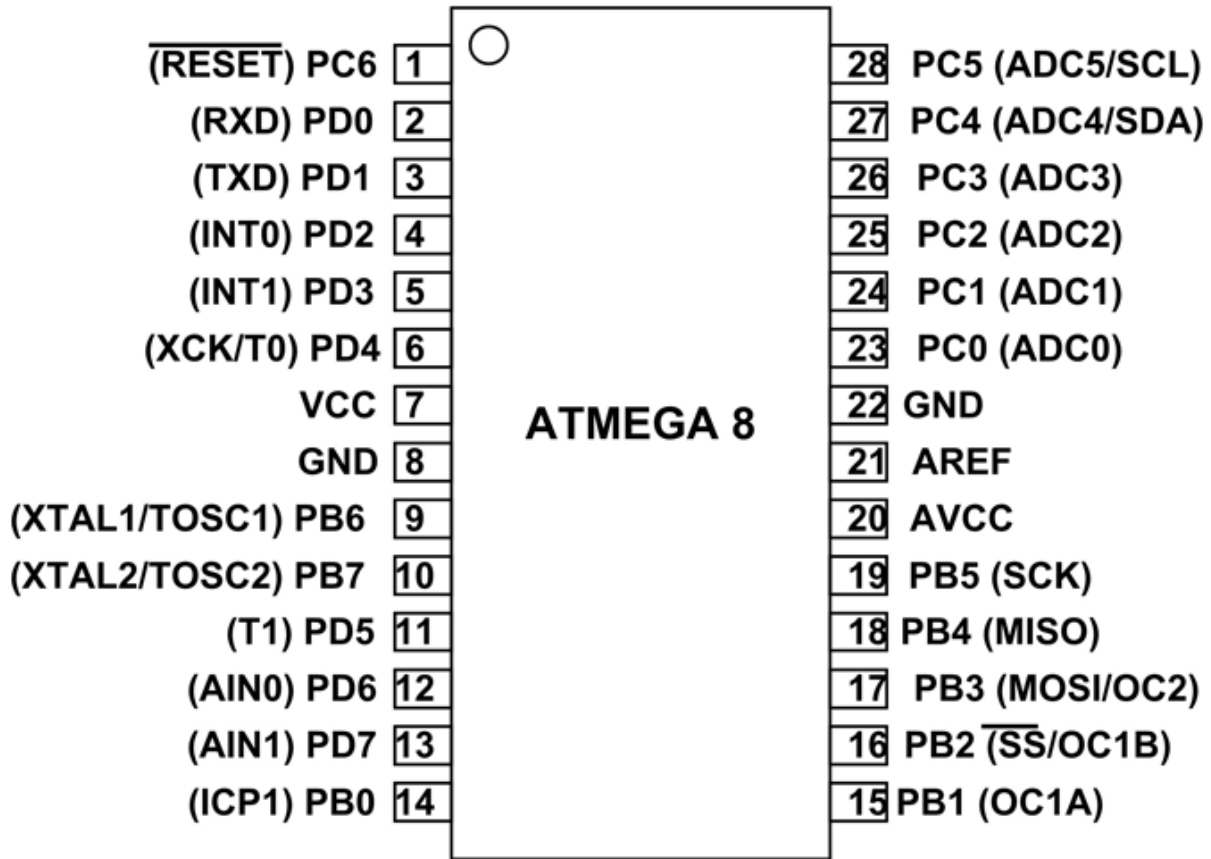


Out of all these pins the Data, Command, Attention and Clock pin are used in the SPI communication with the microcontroller, VCC and GND pin are used for powering up the controller

Interfacing the controller with Arduino boards became much easy because of the libraries available on the internet. The requirement in our case was making the size as small as possible which made us to go for the microcontroller without onboard components and dropped the option of using the Arduino.

## MICROCONTROLLER

ATmega16 microcontroller was used for the communication, later it was replaced by ATmega8 looking upon the size of the circuit we desired.



ATmega 8 is a 28 pin IC which provides 8KB in system programmable flash memory.

There are 3 ports available with the Microcontroller i.e., PORT B, PORT C, PORT D out of which PORT B has got the pin used for the SPI communication i.e., the communication between the PS2 controller and the microcontroller.

## INTERFACING

SPI stands for SERIAL PERIPHERAL INTERFACE which is one of the protocols inside a microcontroller that involves the transmit and receive of data serially.

Now that we were familiar with the type of communication, we needed to find a way to connect it to the microcontroller. Soldering it directly to the microcontroller is not an effective way so while finding the means of connection we decided to go for the PS2 Hubs mounted on a circuit with FRC bases soldered. Thus, making the connections secure and easy.

The pins uses MISO, MOSI, CLK, SS of Atmega16 to have a better check on the program output a 16x2 LCD was used as an output along with the Ps2 controller.

The interface used is CVAVR to program the microcontroller.

The controller sends a byte at the same time as it receives one (full duplex) via serial communication. The clock is held high until a byte is to be sent. It then drops low (active low) to start 8 cycles during which data is simultaneously sent and received. When the clock edge drops low, the values on the line start to change. When the clock goes from low to high, value is actually read. Bytes are transferred LSB (least significant bit) first, so the bits on the left (earlier in time) are less significant. Data to be entered as the command to turn on the analog mode 0x44 in hexadecimal format is shown. It can be seen through the program clearly for a better understanding.

*Turn on analog mode:*

byte #	1	2	3	4	5	6	7	8	9
<b>Command (hex)</b>	01	44	00	0x01	0x03	00	00	00	00
<b>Data (hex)</b>	FF	F3	5A	00	00	00	00	00	00
<b>Section</b>	header			config parameters					

The signals coming from the PS2 controller were decoded and were stored in 6 variables in the program were named as data0, data1, data2, data3, data4, data5 according to the commands given in the form of Hexadecimal format and using the clock as the reference.

The PS2 was successfully connected but was not interfaced with the microcontroller. After a good look up on the circuit again it was found that **PULL-UP** and **PULL-DOWN** resistors are necessary in SPI communication.



Later MISO pin of the microcontroller was pulled up using a PULL UP resistor of 10K ohms and the SS pin of the microcontroller was pulled down using a PULL DOWN resistor of same value i.e. 10K ohms

The values from the controller were printed on a 16x2 LCD which showed the following results from various variables written in the program

Data0:

Keys Set: PAD\_UP, PAD\_DOWN, PAD\_LEFT, PAD\_RIGHT, START, SELECT

Data1:

Keys set: R1, R2, L1, L2, PAD\_CROSS, PAD\_SQUARE, PAD\_TRIANGLE, PAD\_CIRCLE

Data2:

Keys set: RIGHT STICK \_X AXIS

Data3:

Keys set: RIGHT STICK\_Y AXIS

Data4:

Keys set: LEFT STICK\_X AXIS

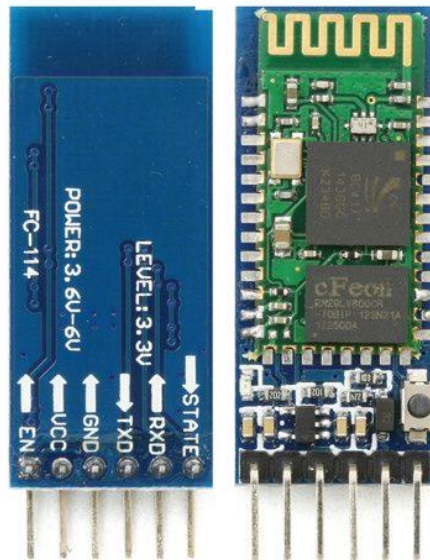
Data5:

Keys set: LEFT SICK\_YAXIS

And thus by determining the values from each key the pss2 was successfully interfaced with the microcontroller which can be observed by the indication LED on the PS2 controller which never goes off when the controller is interfaced.

The controller can now be used to control anything that can be attached to our microcontroller.

## WIRELESS:



## TRANSMISSION OF DATA:

Now that the controller is successfully interfaced with our microcontroller, the task that is left was transmitting the values wirelessly to another microcontroller which was decided to be the ARDUINO MEGA 2560.

Doing a research for the best available wireless modules it was found that RF module has got a good range and stability but the values that can be transmitted were limited. This made us search for another module and looking upon the specifications and our requirements **BLUETOOTH MODULE HC05** was finalized as it fits good.

There are other modules like **HC06** as well but the restriction is that they can't be the transmitter and will only act like a slave to other Bluetooth enabled devices be it your mobile phone or PC.

While HC05 can act like both master and slave i.e., transmitter and the receiver which needs to be initialized before actually using it in our project.

Taking a look at the pinout of the module it is a module with 6 pins.

- 1) **State** pin decides whether the module is acting like a master or a slave which can also be programmed during the initialization
- 2) **Rxd** pin is the receiver pin which is connected to the Tx pin of the microcontroller.
- 3) **Txd** pin is the transmitter pin which is connected to the Rx pin of the microcontroller.
- 4) **GND** is the ground pin which is grounded with the microcontroller so that the module and the microcontroller both share a common ground
- 5) **VCC** pin is for giving the DC supply to the module it can be between 3V to 6V for the Bluetooth module to function.
- 6) **EN** is the ENABLE pin which is used during the initialization of the module which is left unused during the transmission of data between the two modules once they are initialized.

## INITIALIZING THE BLUETOOTH MODULE:

The Bluetooth module needs to be initialized before actually using it..

The procedure is called as the **AT COMMAND MODE** in which the module takes in the commands and works as desired.

The interface used to give the input can be Arduino or any other programming software. Arduino is preferable because of its user friendly interface and ease for programming the module.

To get into the AT COMMAND MODE an Arduino board is required which has a UART ie RX and TX pins.

Now after making the connections as listed:

### Bluetooth module Arduino uno:

Txd -----→TX  
 Rxd -----→Rx  
 Vcc -----→ 5V  
 Gnd -----→ GND  
 EN -----→5V

Now by holding the reset switch on the module and simultaneously powering up the module it redirects us to the AT COMMAND MODE indicating the blink of the light at regular intervals which is once in 2 seconds.

After burring an empty program in the Arduino and opening the Serial monitor the commands can be entered. The commands to be entered are listed below:

### MODULE 1:

**AT+ROLE=1** which configures the module as a master

**AT+NAME=master** which names the module as master

**AT+ADDR?** which is entered to display the address of the module

**AT+UART=9600,1,0** which is the BAUD RATE, stop bit and the parity involved in the data transmission.

**AT+PSWD=xxxxxx** is the password to secure the module from other modules.

**AT+CMODE=0** which means that the module can connect to only one module whose address is specified

**AT+BIND=xxxx, xx, xxxx** which will be the address of the module acting like the slave.

### MODULE 2:

**AT+ROLE=0** which configures the module as a slave

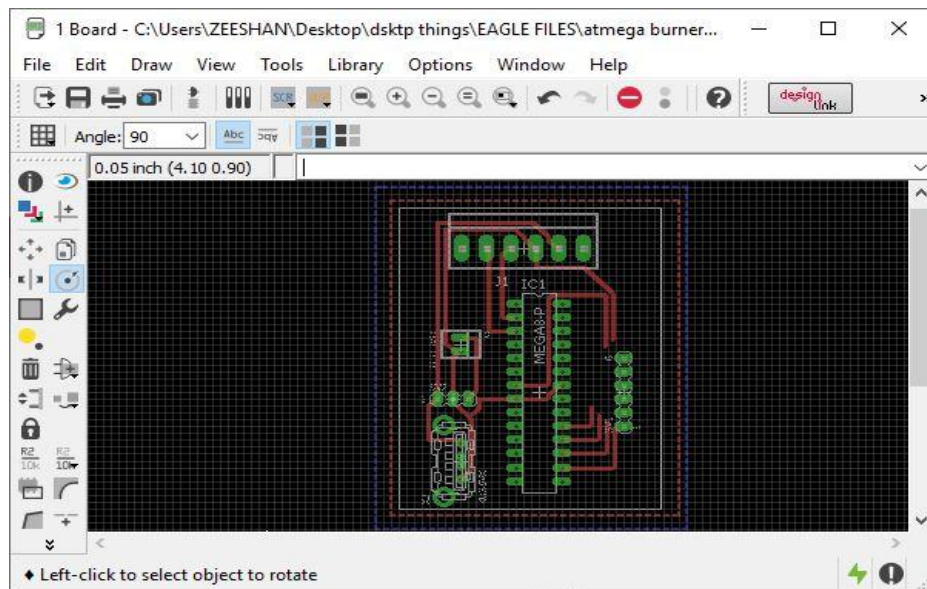
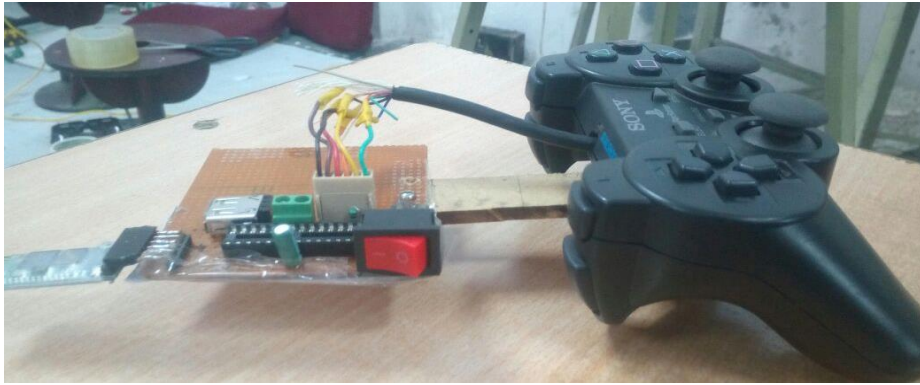
**AT+NAME=slave** which names the module as slave

**AT+ADDR?** which is entered to display the address of the module

**AT+UART=9600, 1, 0** which is the BAUD RATE, stop bit and the parity involved in the data transmission.

**AT+CMODE=0** which means that the module can connect to only one module whose address is specified

**AT+BIND=xxxx,xx,xxxx** which will be the address of the module acting like the slave.



### TRANSMISSION OF DATA:

Now that the Bluetooth modules are initialized it is connected to both the circuits i.e., on the master and the slave. The transmitter is Atmega8 and the receiver is Arduino Mega2560 which was later replaced with Arduino Duo.

The transmitter is programmed using CAVR software in which UART and SPI was used for the PS2 controller and the Bluetooth module HC05.

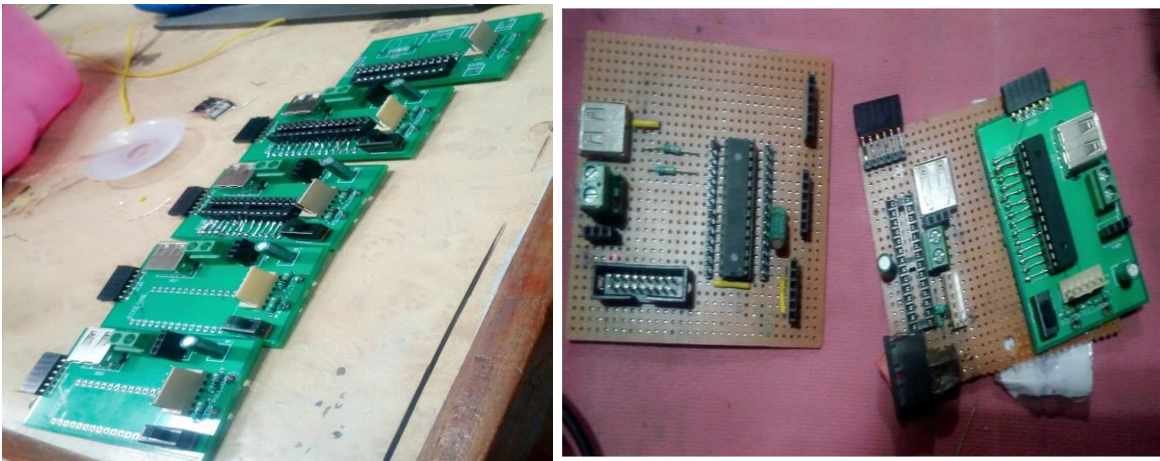
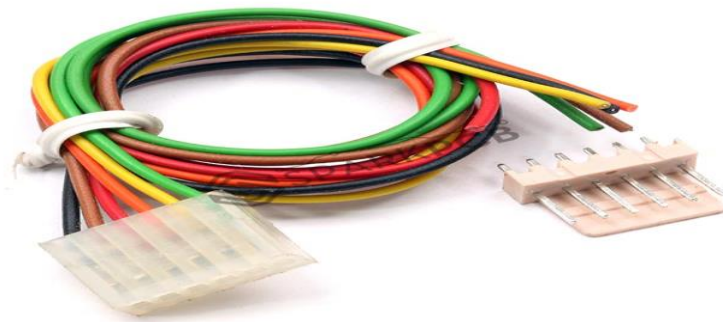
Below attached is the link to the program written in CAVR.

The task to be done when a particular button is pressed is handled by assigning the characters i.e., a different character for different button. The characters are transmitted through the UART using the function `putchar('<ASSIGNED CHARACTER>')`

The Analog values through the sticks or the gears are ranging from 0 to 255 now the issue arises. There are two gears giving up the same value and when the values are transmitted it takes the value coming from only on stick hence there cannot be a unique task using the values of two sticks. Hence to overcome the issue the values are mapped by adding a high value so that it is transmitted within a particular range and hence can be used for two different tasks. The data received at the receiver side was used by reading using `Serial.read()` and the data was stored in a variable to compare with the other conditions.

## CIRCUIT AND CONNECTIONS:

At the transmitter side the ps2 controller was made wireless by attaching a circuit designed in **CADSOFT EAGLE**. The circuit is designed so that it can be powered by various ways using a 12V battery and also by using a power Bank through a USB port attached onto the circuit. The circuit can also be powered by using a 5V Lipo battery so that the weight and size is minimized to its best. the transmitter fixed with a draft circuit is shown in the picture above. The cables of the PS2 were made short and soldered to multistrand cables so that it can be easily pulled onto the **Relimate** base mounted onto the circuit.



The circuits were designed and manufactured. The components were hand soldered onto the PCB.

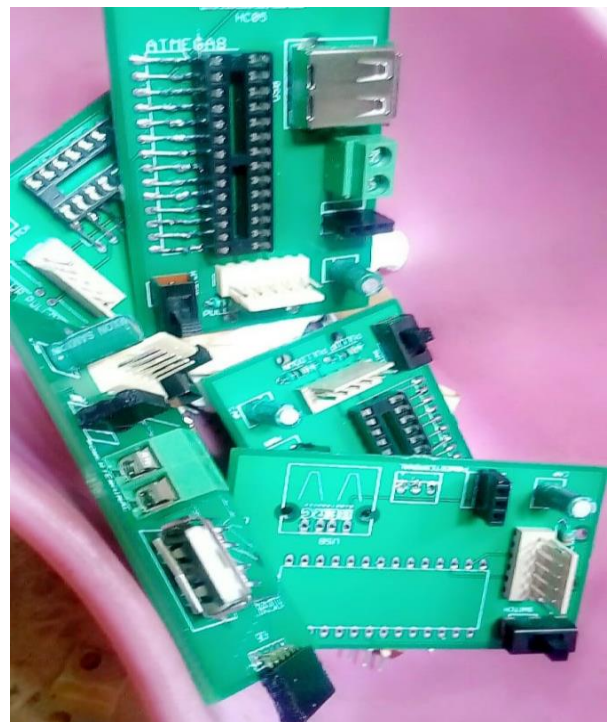
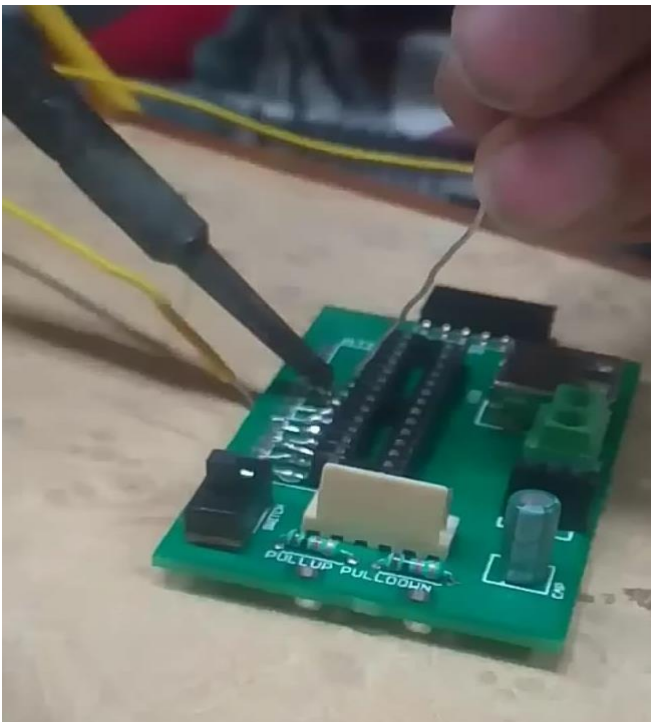
## ISSUES FACED:

UART allows only `string` and `char` datatypes to be transmitted hence the analog values are to be converted by storing it in a variable whose datatype is `unsignedcharx[10]`; Now that the values are successfully transmitted and received successfully but the issue was the errors in the receiving side. The value received is not as desired, the value which was expected changes because of the very next value mixed with the present value.

In other words, If 255 is transmitted then it is received as 2, 55, 2552 at a time which makes the value completely unusable in the code.

This problem was overcome by writing a simple code at the receiving side. it was observed that by sending a character `'\0'` or `'\n'` after a successful transmission can be used as a separating element between two successive values.

The controller developed can be further modified by using microcontrollers of as minimum size as possible. Further the BLUETOOTH MODULE HC05 can be replaced by using BLUETOOTH LOW ENERGY (BLE) which will consume less power.

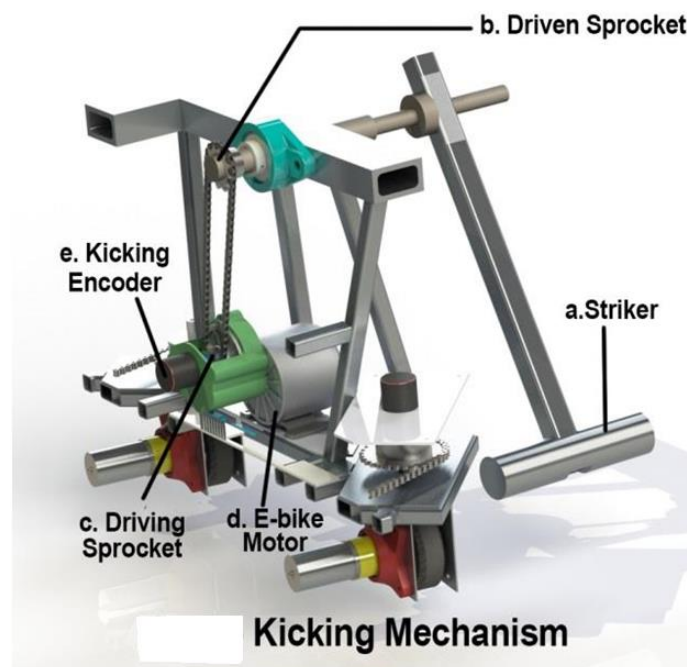


### Kicking mechanism:

- Kicking the rugby ball of 500gm (approximate) to the goal post from the chosen kick zone requires high **power** and **accuracy**.

- **Structure and function of foot:**

The kicking mechanism consists of a cylindrical “foot”, connected to a “leg” which is attached to a sprocket. This is also driven by a 24 Volt E-bike motor which also rests on the base of the chassis. The cylindrical block has been chosen for its convex contact area with the ball. It is solid so as to increase the mass of the foot, which in turn increases the moment and decreases any loss of energy in the form of plastic or elastic deformation. The kicking rod’s length has been set as 416 mm. The motor will be driven at approx. 260 rpm and thus the angular velocity of 27.16 rad /sec is achieved. From the above values, we obtain the tangential velocity of 11.36 m/s.



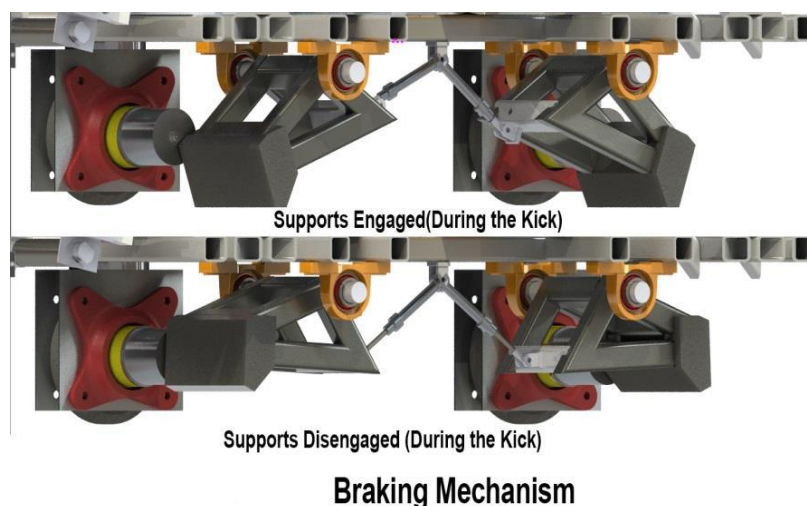


### ➤ Actuation of kicking mechanism:

To achieve a successful goal kick, the foot must hit the ball with an angle ranging from  $37^\circ$  to  $62^\circ$  for the above calculated tangential velocity. Also, a power of 80 Watt is required for the above kick, which is sufficiently supplied by the **E-Bike motor** (350 Watt rated). While kicking, the orientation of the robot with respect to the wall is maintained using two **TF mini LIDARs** (applying PID algorithm) before every kick for higher **precision** and **accuracy**.

### ➤ Maintaining stability:

In order to maintain accuracy during the kick, the robot has to be stabilized using a support mechanism which is a first-class lever actuated by a piston. When the member actuated by the piston touches the ground, it forms a simple wedge truss. This truss stabilizes the **PR** as any reaction force experienced by the **PR** is directed into the plate along the inclination of the wedge. Thus, the **PR** doesn't experience any sudden jerks while kicking the ball.



➤ Using the 2D projectile motion equations:

- In order to kick the ball through conversion post from KZ3, F the robot has to rotate at an angle of  $22.3^\circ$  with respect to receiving zone wall.
- Distance between the Tee of KZ3 and the conversion post is 9723mm.
- The ball has to pass through the area between the poles and has to be above a height of 1500mm for a goal.
- When the ball is hit, its trajectory can be explained by taking the 2D projectile approach. The motion in the y-direction is continuously acted upon by the gravitational force and there is no force acting in the x-direction. Considering the following equations:

where  $x = 9723\text{mm}$ ,  
 $u = 11.36\text{m/s}$

$$x = u \cos \theta . t \quad \text{----->1.}$$

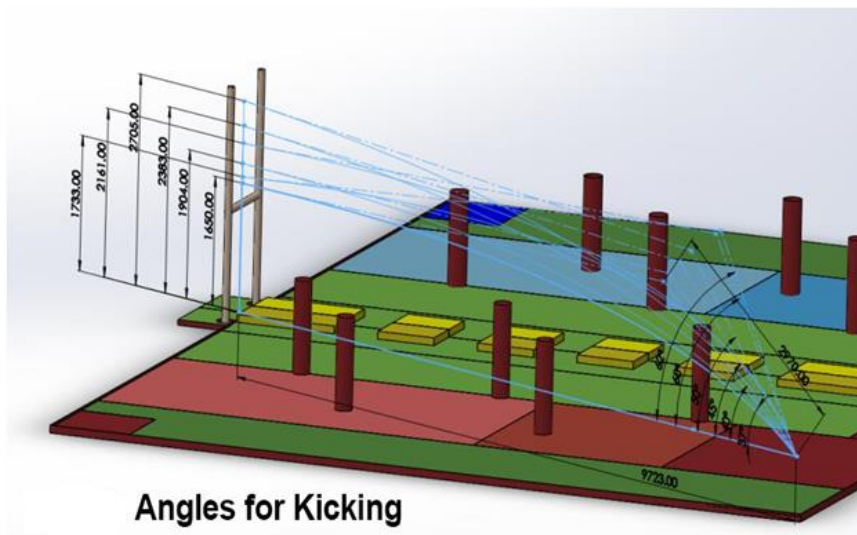
$$t = \frac{x}{u \cos \theta} \quad \text{----->2.}$$

$$y = u \sin \theta . t - \frac{1}{2} g t^2 \quad \text{----->3.}$$

$$y = u \sin \theta . \frac{x}{u \cos \theta} - \frac{1}{2} g \frac{x^2}{u^2 \cos^2 \theta} \quad \text{----->4.}$$

$$y = x . \tan \theta - \frac{1}{2} g \frac{x^2}{u^2 \cos^2 \theta} \quad \text{----->5.}$$

- The final equation is used to check if the height of the ball's trajectory is above 1500mm at the conversion post for different projection angles. Using the above equations, we found that the angles ranging from  $37^\circ$  to  $62^\circ$  will successfully result in a goal.
- Even if we take air resistance into account, the ball will be made to pass through the conversion post by slightly increasing the RPM to overcome it. The path of the trajectory is free of obstacles.



### ➤ Components used and their specifications:

- Actuators of kicking mechanism

E bike MY 1016Z3 motor: 324 RPM, 24V DC, 110 kg-cm (stall torque), 350W (rated power), 38.7W (power required).

- Components to determine the kicking angle

Kicking Mechanism Encoder: Incremental type, 5-24V DC, PPR=360, CPR=1440

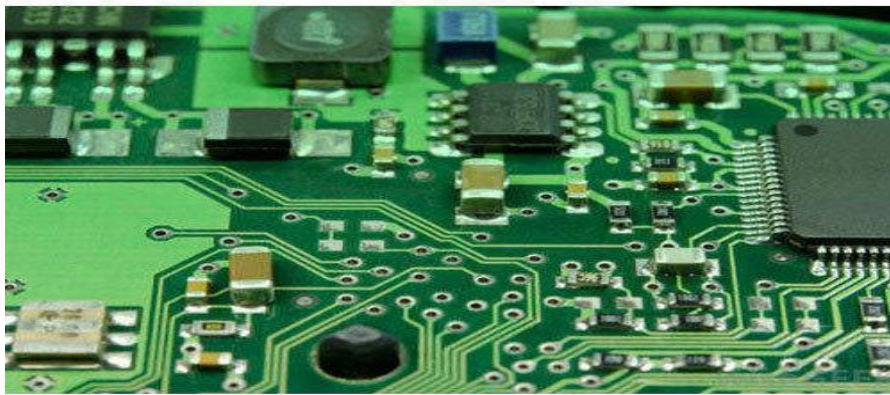
- Components used to position PR for the kick with respect to the wall

TF mini LIDAR: Max. Range 12m, 4.5-6V

- To kick the rugby ball there was a leg attached to sprocket driven by E-bike motor.
- After placing the rugby ball in the desired kick zone, the bot is placed according to the ball position and kicking mechanism is actuated.
- To maintain required RPM an encoder is attached to E-bike motor and momentum required for perfect kick can be controlled.
- To maintain accuracy during the kick, the robot has to be stabilized using a support mechanism which is a first-class lever actuated by a piston.

## Circuit designing:

The process of circuit design can cover systems ranging from complex electronic systems all the way down to the individual transistors within an integrated circuit. For simple circuits the design process can often be done by one person without needing a planned or structured design process, but for more complex designs, teams of designers following a systematic approach with intelligently guided computer simulation are becoming increasingly common. In integrated circuit design automation, the term "circuit design" often refers to the step of the design cycle which outputs the schematics of the integrated circuit. Typically, this is the step between logic design and physical design.



## Our project circuit design:

We have designed our own circuits for both of our bots i.e., PR and TR. We designed on CADSOFT EAGLE which is well known for PCB designing.

### Circuit for PR:

Components required for PR bot on our circuit to be design.

1. 3 pistons -2pins each total 6pins
2. 2 E-Bike motors-total 4 pins.
3. Orange Planetary geared DC motor-4pins.
4. 5 encoders-5 pins base total 25 pins
5. Arduino DUE
6. TF mini lidar-4 pins
7. Class 2 laser- 2 pins total 4 pins
8. Ps2 base – 1
9. Motor driver 7 pins
10. Resistors and diodes

## Circuit for TR:

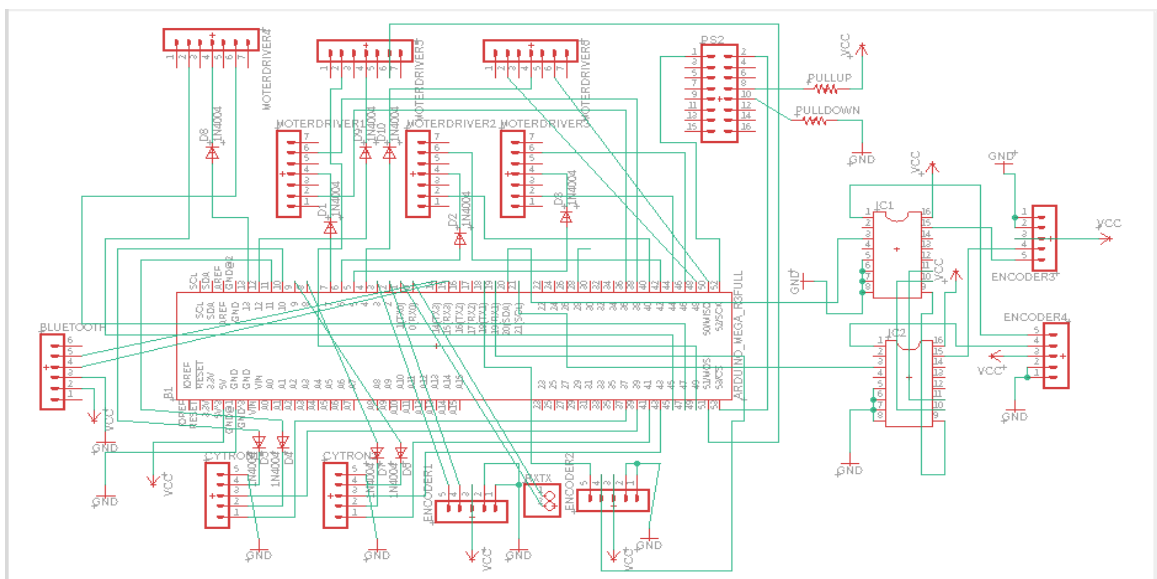
Components required for TR bot on our circuit to be design.

1. Orange Planetary geared DC motor-4pins.
2. 3 encoders – total 15 pins
3. Linear Actuator 2pins
4. Hercules motor 7pins
5. Arduino mega base.
6. Ps2 base-1
7. Resistors and diodes

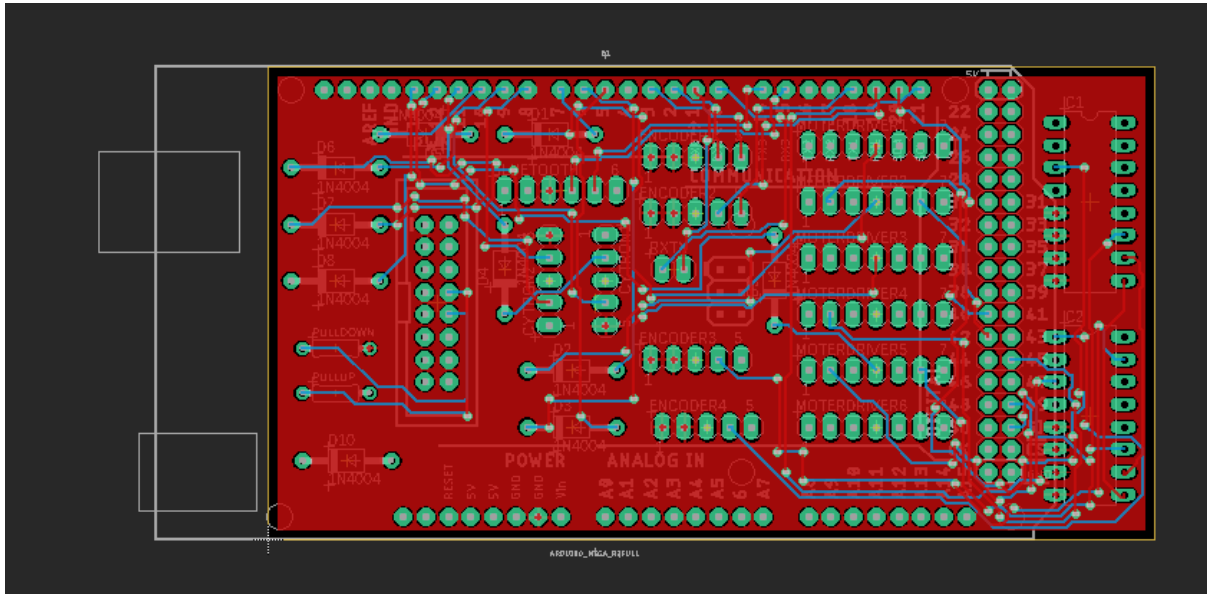
## Proposed designs in eagle software:

We have designed this circuit in such a way that it can be used on both PR and TR bots.

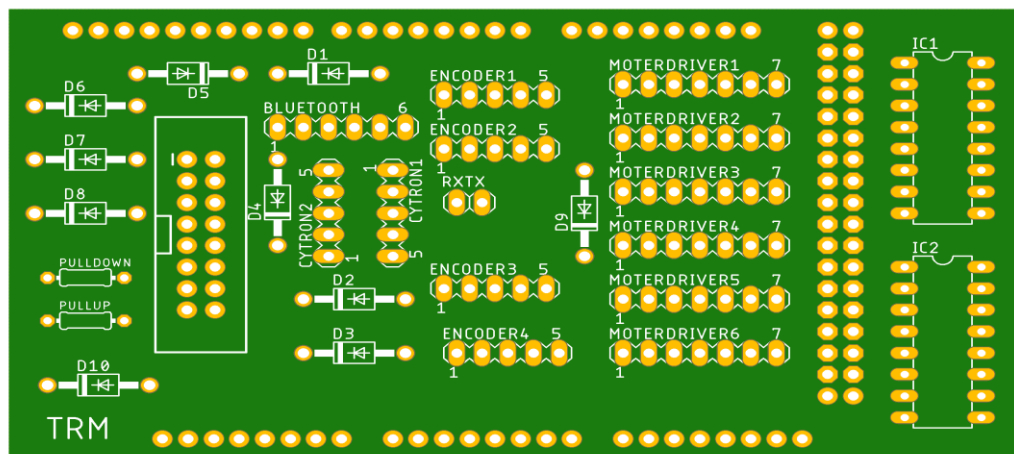
## SCHEMATIC VIEW:



## BOARD VIEW:



## PCB TOP VIEW:



## Receiving mechanism (try bot):

- The launched ball is received by the TR in a funnel like structure (Fig 2.1) which is covered by nylon mesh in order to damp the momentum of 75.5N Force.
- The ball which was accelerated to a speed of 6.4m/s. The funnel is extended in vertical axis i.e., 385mm in order to avoid a miss whenever the ball is being over thrown (allowance).
- The ball travels through the funnel and stops at the close end of funnel due to the try plate.
- Now it is at a suitable position for the try task.

- The skeleton of funnel is made with aluminium tube of 20x20x2mm of 6061 grades.
- As6061 is a precipitation-hardened aluminium alloy, containing magnesium and silicon as its major alloying elements. Originally called "Alloy 61S".It has good mechanical properties, exhibits good weldability, and is very commonly extruded.

## ROS

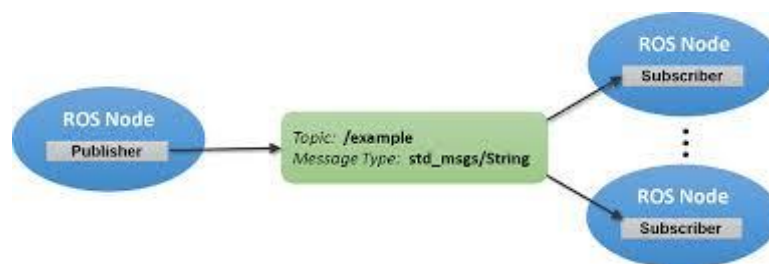
### ROS Project

#### TO Publish and Subscribe a particular topic:

The primary mechanism for ROS nodes to exchange data is sending and receiving messages. Messages are transmitted on a topic, and each topic has a unique name in the ROS network. If a node wants to share information, it uses a publisher to send data to a topic. A node that wants to receive that information uses a subscriber to that same topic. Besides its unique name, each topic also has a message type, which determines the types of messages that are capable of being transmitted under that topic.

This publisher and subscriber communication has the following characteristics:

- Topics are used for many-to-many communication. Many publishers can send messages to the same topic and many subscribers can receive them.
- Publishers and subscribers are decoupled through topics and can be created and destroyed in any order. A message can be published to a topic even if there are no active subscribers.



#### Step followed:

- Create a src directory in the beginner\_tutorials package directory.
- This directory will contain any source files for our beginner\_tutorials package.
- Create the src/talker.cpp file within the beginner\_tutorials package .

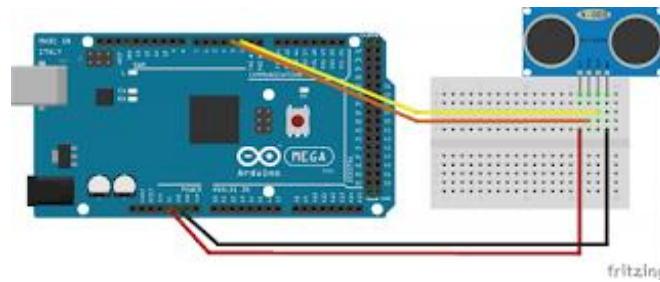
### RVIZ with ROS arduino (publish and subscriber)

#### Objectives:

To use publish and subscribe in ROS

To use ultrasonic SRF04 sensors and its parameters

To simulate the sensor's (frame id, topics) data inside ROS visualization tool (rviz)



The primary mechanism for ROS nodes to exchange data is sending and receiving messages. Messages are transmitted on a topic, and each topic has a unique name in the ROS network. If a node wants to share information, it uses a publisher to send data to a topic. A node that wants to receive that information uses a subscriber to that same topic. Besides its unique name, each topic also has a message type, which determines the types of messages that are capable of being transmitted under that topic.

Rviz is a powerful robot visualization tool. It provides a convenient GUI to visualize sensor data, robot models, environment maps, which is useful for developing and debugging your robot controllers.

Rviz is the visualization software that will allow you to view that gazebo data (if you are simulating) or real world data (if you are not using gazebo, but a real robot)

#### Step followed

\_write the arduino code in ROS arduino

#### Code

```
#include <ros.h>
#include <ros/time.h>
#include <sensor_msgs/Range.h>

ros::NodeHandle nh;
sensor_msgs::Range sonar_msg;
ros::Publisher pub_sonar( "rangeSonar", &sonar_msg);
float sensoReading = 0;

// this constant won't change. It's the pin number of the sensor's output:
const int trigPin = 7;
const int echoPin= 5;

char frameid[] ="/sonar_ranger";
void setup() {
  // initialize serial communication:
```



```

Serial.begin(9600);
nh.initNode();
nh.advertise(pub_sonar);
pinMode(trigPin,OUTPUT);
pinMode(echoPin,INPUT);
sonar_msg.radiation_type = sensor_msgs::Range::ULTRASOUND;
sonar_msg.header.frame_id = frameid;
sonar_msg.field_of_view = (10.0/180.0) * 3.14;
sonar_msg.min_range = 0.0;
sonar_msg.max_range = 10.0;

}
int duration;
unsigned long publisher_timer;
void loop() {
    sensoReading = 0 ;

    // establish variables for duration of the ping, and the distance result
    // in inches and centimeters:

if ((millis() - publisher_timer)> 50 )
    {
        digitalWrite(trigPin,LOW);
        delayMicroseconds(2);
        digitalWrite(trigPin,HIGH);
        delayMicroseconds(10);

        duration = pulseIn(echoPin, HIGH);
        sensoReading = duration *0.342/2000;
        //sensoReading = getDistance;
        sonar_msg.range = sensoReading;
        Serial.println(sensoReading);
        sonar_msg.header.stamp = nh.now();
        pub_sonar.publish(&sonar_msg);
        publisher_timer = millis(); //publish once a second

    }

nh.spinOnce();

```

```
}

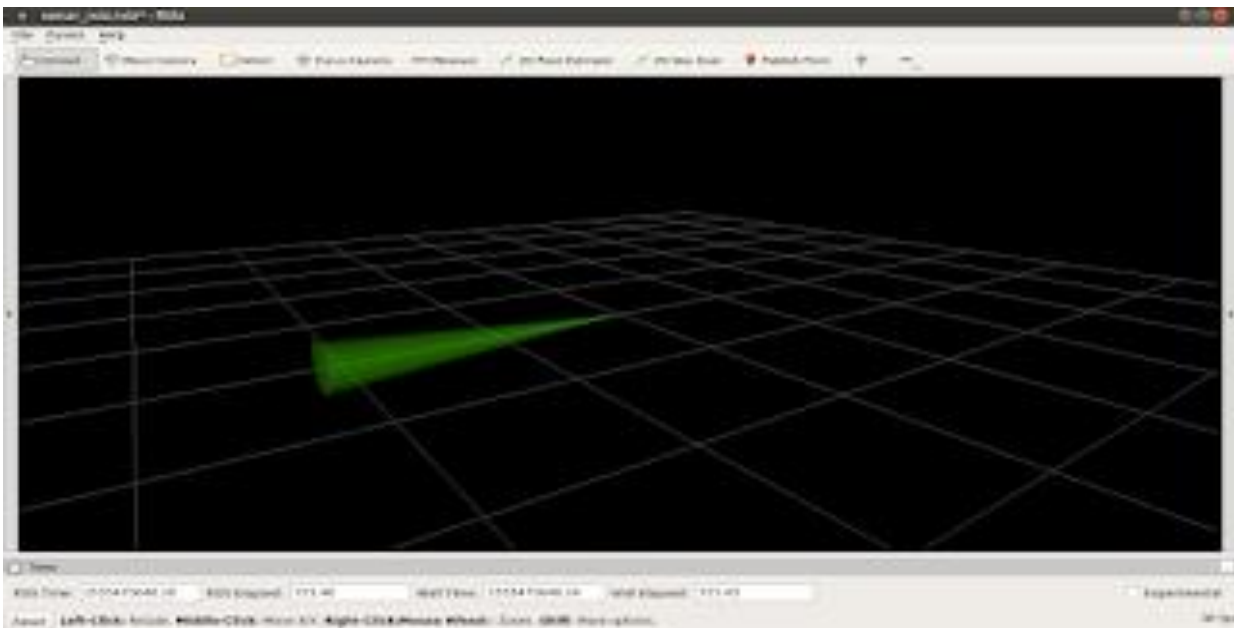
```

- Run Arduino with serial port argument
- Echo or display the data content in the "sonaRange topic"
- Run ros visualization tool "rviz"
- In rviz GUI Change frame id name from map to "/sonar\_ranger"
- In Rviz GUI you can see the prism length varies according to the distance emitted by the Sonar SRF04 ultrasonic sensor.

Simulate the rviz if the circular prism change is length as you will interrupt the sonar range of the ultrasound.

### OUTPUT:

- The Range measurements are displayed as cones which indicate the field of view of the sensor.
- It mainly helps in mapping of bots
- In Rviz GUI you can see the prism length varies according to the distance emitted by the Sonar SRF04 ultrasonic sensor.
- Simulate the rviz if the circular prism change is length as you will interrupt the sonar range of the ultrasound.



### GAZEBO SIMULINK:

One of the most important reasons to use **ROS** is Gazebo. It's a powerful robot simulation platform for almost every commercial robots. There **are** a lot of expensive robots like Turtlebot and with Gazebo we can write some code and test the robots for free.

### Task:

The task is to achieve a successful goal kick; the foot must hit the ball with a given angle

### OVERVIEW:

The bot was designed in solid works and then imported in the simulation workspace by converting it into URDF file .These files were launch in gazebo workspace of ROS where simulink takes place.

A natural environment was created in the Simulink space by changing the friction and damping condition of the floor, where the bot was supposed to move after the production.

### STEP FOLLOWED:

First we can import solid works model in gazebo ROS by The SolidWorks to URDF exporter is a SolidWorks add-in that allows for the convenient export of SW Parts and Assemblies into a URDF file. The exporter will create a ROS-like package that contains a directory for meshes, textures and robots (urdf files).

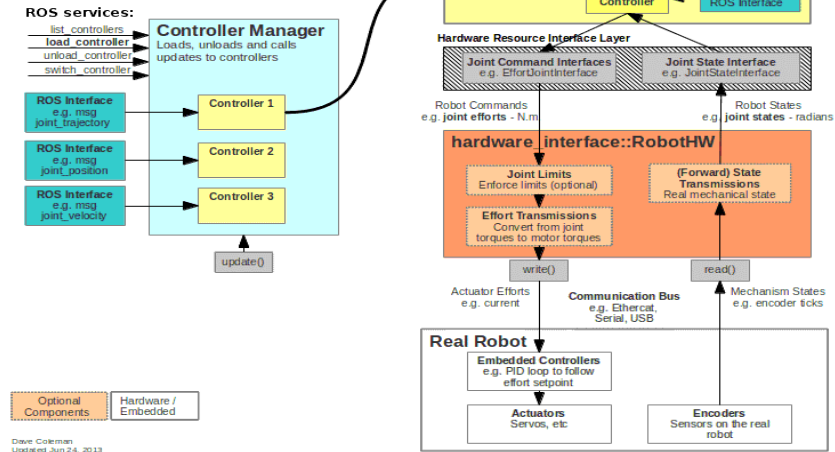
The file is a tree structure of child links (like wheels and arms) connected to parent links (like the chassis) by a series of joints. This file is the description of how your system moves internally, and this will determine how it can interact with the environment.

Our chassis is launch in gazebo launch file to simulate this we add transmission files to use ros\_control with your robot, The <transmission> element is used to link actuators to joints, see the for exact XML format.

The ros\_control packages take as input the joint state data from your robot's actuator's encoders and an input set point. It uses a generic control loop feedback mechanism, typically a PID controller, to control the output, typically effort, sent to your actuators. ros\_control gets more complicated for physical mechanisms that do not have one-to-one mappings of joint positions, efforts, etc but these scenarios are accounted for using transmissions.

# ROS Control

Data flow of controllers



# MUFFAKHAM JAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(SULTAN UL-ULOOM EDUCATIONAL SOCIETY)

**Sub: SETTLEMENT OF THE BILLS FOR THE MONEY SANCTIONED TO ROBOCON TEAM, MJCET**

DATE: 9<sup>th</sup> November, 2020

To,  
The Advisor cum Director,  
MJCET.  
Sir,

This is to inform you kindly that MJCET has sponsored an amount of Rs2,00,000/- towards the fabrication & participation of our team in ROBOCON-2020. The college has given a cheque of Rs2,00,000/- in the name of Head, Dept of ECE, MJCET with cheque No-501957 dated 10/03/2020.

An amount of Rs. **1,64,768/-** was spent for the design & fabrication of the two Robots which is shown in the table below:

Sl.No	Bill No.	Date	Particular	Retailers	Amount
1					
2					
3					

\*particulars of expenditure are enclosed in separate sheets

**Amount given to TRM: Rs 1,80,500/-**

**Amount Spent: Rs. 1,64,768 /-**

**Amount remaining:Rs 15,732/-**

The remaining amount of Rs 35,232/- is returned in the form of cheque of Rs 35232/- in the name of MJCET.

Thank you, sir,

Yours sincerely,  
Head, ECED.

# REPORT

Conference recording centre was set up in 2020 – 2021.

An Audio plays a major role for creating e-course content. Along with video, animation, and text, audio narration makes an online lesson more natural and helps the audience quickly grasp what we are teaching. Conference recording centre (CRC) fulfills this requirement.

While creating the centre we encountered and tried to solve the following problems

- How to record a quality narration when you're on a tight budget;
- How to select a voice over microphone;
- How to record and edit audio.

**Following equipment were procured for the setup of LRC**

1. Audio System
2. Mic
3. Speaker
4. ACs

5. Projector

6. Motorised Curtains

### **About Ahuja AMPLIFIER System**

- Contains Preamplifier and Line Output for connecting to a Booster Amplifier and for recording the programme
- Line Input for connecting the output from any external mixer to be used as a Booster Power Amplifier.
- Resettable circuit breaker for protection against overload and short circuit.

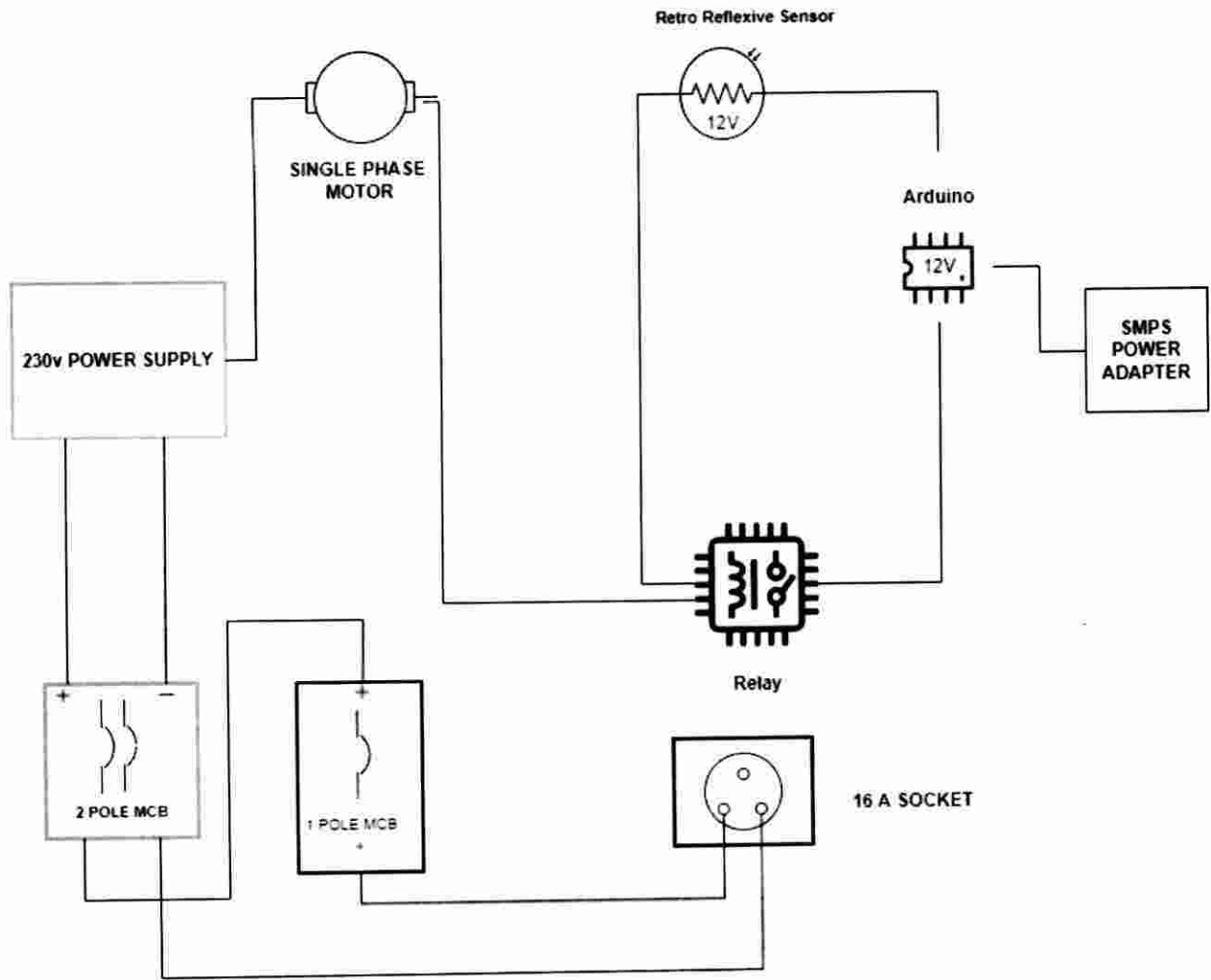
2021 IEEE HAC /SIGHT Covid-19 Project

# Smart waste management for Covid -19 related primary health care centers and villages in remote areas

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28/04/2021  
Banjara Hills, Road No. 3,  
HYDERABAD-500 034.(T.S.)



Circuit Implementation Process



CIRCUIT DIAGRAM

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downs. It has completed 21 laps in 4 hours of drive on the off road mud terrain. Most of the other vehicles have failed to finish endurance due to their vehicle break downs. Maximum no. of laps completed by the winner team is 28 laps. The factors that have contributed in the success of Endurance test are vehicle sturdy design, low weight, driving skills and fitness of the driver. Team spirit, hard work and persistence helped us to achieve the favorable results. Valedictory function was conducted in the afternoon, where in winner and runner teams have received their prizes. In the evening team has packed the vehicle and tools in the truck and sent back to the College.

### **Final Results:**


MJCET team stands at **7<sup>th</sup> rank** in the final endurance test nationwide and achieves **1<sup>st</sup> rank** in Telangana and Andhra Pradesh States in the overall ranking.

### **Recruitment drive:**

Five students of MJCET are short listed in the aptitude test and psychometric test. Technical and HR interviews are conducted on 27<sup>th</sup> and 28<sup>th</sup> January 2020. Two students are selected in the recruitment by reputed automobile companies at SAE – BAJA 2020 conventions, like Anand Motors and ARAI, Pune.

### **Funding:**

MJCET management has sanctioned a fund of Rs. 60,000/- in the month of September 2019. The fund is used for the vehicle fabrication and transportation.

  
28/01/2020  
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# **REPORT ON CONFERENCE RECORDING CENTRE**

Conference recording centre was set up in 2020 – 2021.

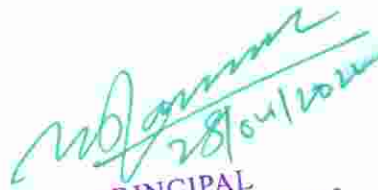
Conference recording centre (CRC) provides the optimum recording facility in a dedicated, distraction-free environment. As Audio plays a major role for creating e-content along with video, animation, and text, audio narration makes an online contents more natural and helps the audience quickly grasp.

While creating the centre we encountered and tried to solve the following problems

- How to record a quality narration when you're on a tight budget;
- How to select a voice over microphone;
- How to record and edit audio.

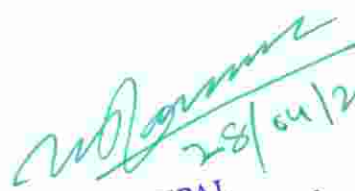
**Following equipment were procured for the setup of CRC**

- 1. Audio System**
- 2. Mic**
- 3. Speaker**
- 4. ACs**
- 5. Projector**

  
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## About Audio Amplifier System

- Contains Preamplifier and Line Output for connecting to a Booster Amplifier and for recording the programme
- Line Input for connecting the output from any external mixer to be used as a Booster Power Amplifier.
- Resettable circuit breaker for protection against overload and short circuit.
- With low noise, high intelligibility and durability, the speakers on both sides of the stage can work well without distortion even in a high-power working environment, for creating a stereo original sound in every corner of the conference room. As the multifunctional conference system solution provided by DSPPA for the lecture hall has powerful functions and easy-to-understand system operation, it can effectively guarantee the daily operation of various meetings and activities in the conference room.

  
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Dr. Shaik Kareem Ahmed was facilitated after organising a workshop on improving H-index.

*Handwritten signature and date: 28/04/2022*



*M. J. ...*  
28/04/2022