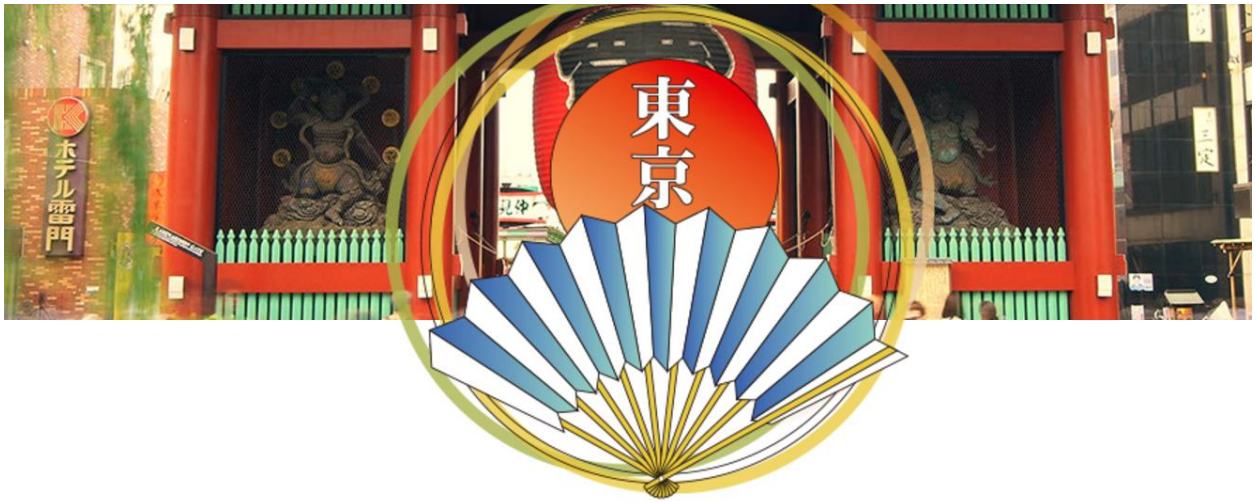
AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD

PROJECT REPORT

ON



INTERNATIONAL ROBOTICS COMPETITION

THEME

The Landing Disc

INDEX

TITLE

THE ABUROBOCON

Robocon, short for **Robotic Contest**, is an interesting game - cum - intellectual exercise for budding engineers and their enthusiastic instructors, determined to innovate and create machines for producing desired results. Participation in this activity is an end-to-end competitive experience from concept design of a system of robots programmed to perform according to rules of the game played on a high precision technical Contest Area and to score a victory beating the competitors; all this according to a Theme declared by the Host Country.

International Robocon is mainly sponsored by Asia Pacific Broadcasting Union (ABU) which includes Doordarshan (Prasarbharati) of India as a member which has been organizing all activities in India for last Nine years with collaboration with MIT Group of Institutions, Pune, India.

Robotic Contests (Robocon) organized by Asia Pacific Broadcasting Union (ABU) and its member countries offer young engineers a platform to innovate and excel in creative thinking. Here, they demonstrate their technical ideas in robotics, as well as establish cross cultural contacts in an environment. These events also offer great opportunity to broadcasting agencies for advancing their technological skills and international co-operation. The International and National Robocon have started from 2012.

The first year international host country was Tokyo, Japan with the theme "Reach for The Top of Mt. Fuji" and ABU Winner was Ho Chi Minh City University of Technology, Vietnam, and the Indian contest organized by IIT Kanpur with Institute of Technology, Nirma University as a National winner.

The 2016 ABU Robocon was held at Bangkok, Thailand. The theme was "Clean Energy Recharging the World". The concept behind the theme is the utilization of renewable energy sources. The match was between 2 teams (viz. red and blue), each team consisting of two robots. VIER (Vadodra Institute of Engineering) won the National Robocon 2016. University of Technology (UTM), Malaysia won the International Robocon 2016.

After final winner was announced in 2016 finals, **JAPAN** has introduced this year's new theme based on **"THE LANDING DISC"**.

ABURobocon 2017

THE LANDING DISC

ROBOCON 2017 THEME AND RULE BOOK

The ABU Asia-Pacific Robot Contest “Robocon 2017” will be held in Tokyo, Japan.

To get the participants acquainted with the format of the contest, the theme rule book was launched by NHK Japan.
The theme revolves around the word “Asobi” (play), which is also a fundamental philosophy behind Robocon.
In “ASOBI”, playful, unique, original show of skills is often more important than winning or losing, as everyone – friend and foe alike – can applaud and enjoy them.

Theme Video Link : https://www.youtube.com/watch?v=boUMyBLQ_O0

THE SAFETY:

In ABU Robocon, safety is a top priority. Participants shall give safety precedence over everything at all times, from the robot designing and building stages to taking part in the actual contest.

They are also asked to cooperate fully with the organizer in order to ensure a safe running of the contest for everyone involved, including team members, spectators, officials, and staff, as well as for the surrounding environment.

THE DOMESTIC CONTESTS:

All domestic contests held in order to select the representing teams that will participate in ABU Robocon 2017 Tokyo should adhere to the rules laid out in this Rule Book.

However, it is understood that if (a) material(s) is/are not available, organizers are to employ the best possible replacement(s) available in their country/region.

CONTEST RULES:

Terms	Definitions
Robot	The robot that will throw the flying discs.
Flying disc	The flying disc to be used in the contest. Product name: Volley® Soft Saucer Colors: Red and Blue A team uses fifty (50) in each game. Abbreviation: Disc
Spot	The place to land the discs. On the field are seven (7) with different heights and areas. In the center of each is a hole with a diameter of 150mm. At the start of the match, a beach ball rests on each.
Beach ball	The beach ball (inflated diameter 30cm) on the spots. Seven (7) colors. Abbreviation: Ball
Start Zone	Zone from where the robot starts the game. Abbreviation: SZ
Loading Area	Area where the discs are placed. The robot loads the discs here. Abbreviation: LA
Throwing Area	Area from which the robot throws the discs. Abbreviation: TA
No Contact Area	Area which the robot cannot come in contact with. The robot is able to enter the space above. Abbreviation: NC

CONTEST OUTLINE:

Each game will be conducted between two teams, each with one (1) robot.
The game field is a rectangle divided into two sides for each team. (see figures down below)
Each side consists of a Start Zone, Throwing Area, and Loading Area as seen in figures.
On the field are seven (7) spots consisting of a circular table attached to a column with varying heights and areas.
Of the seven (7) spots, five (5) are placed along the centre line dividing the sides, while the remaining two (2) are placed near to each side.
The heights and sizes of each spot are as shown in figures.
At the start of the game, a beach ball rests on the centre of all the spots.
The number of discs a team can use during the game shall be fifty (50) placed at the Loading Area.
After the start of the game, the team may load discs onto its robot once the robot reaches the Loading Area.
The robots of both teams may throw discs at any ball on any spot to knock the balls off the spots.
Scores will be counted when a team's disc lands on a spot where its ball has been knocked off.
When all the balls have been knocked off of their spot and a team successfully lands its discs on all the spots, that team reaches "APPARE!", and is declared the winner of the game.
If neither team reaches "APPARE!", and either both use up the fifty (50) discs or the game time of three (3) minutes passes, the game shall end. The winner will be decided by who has the higher score at the said end of the game.

GAME PROCEDURE:

Set-up:

1. Prior to each game, a one-minute set-up time is given to the teams through the signal from the referee.
2. The three (3) team members and up to three (3) pit crew members shall be allowed to participate in the set-up.
3. Each team shall commence set-up when the signal is given, and must stop when the one (1) minute is up.
4. If a team fails to complete its set-up within the given one (1) minute, it may resume set-up after the start of the game by obtaining permission from the referee.

Start of the game:

1. After the end of set-up time, the game shall begin at the signal from the referee.
2. Teams that complete their set-up after the start of the game shall obtain permission from the referee at that moment to commence moving their robots.

Team members during the game:

1. Team members are not allowed to enter the game field without permission from the referee.
2. Team members are not allowed to touch their robot other than after referee permission during a retry or disc loading.
3. If a team is controlling the robot manually, one (1) pre-registered operator may do so from the designated area outside the game field.

Handling of the discs:

1. During the game, a team may load the discs once all parts of the robot touching the game field floor completely enter the Loading Area, and permission is given by the referee.
2. Team members may load the discs manually.
3. Jigs and containers such as magazines may be used during loading, but if these are to remain attached to the robot, they shall be included in the robot size.
4. After loading, a team may restart after permission from the referee. Until then, no part of the robot may touch the floor outside the Loading Area.
5. If a team is deemed to be in violation, the robot must return to loading area for a mandatory retry.
6. The robot may throw discs only when it is in contact with the Throwing Area and no other area.
7. The discs for each team will be prepared by the organizer.
8. If a disc that was loaded onto a robot falls on the floor in or outside the game field during the game, that disc becomes invalid and can no longer be used.

Score:

1. After the start of the game, a team is given the following points when its disc lands on a spot without a ball 1) The spot nearest to the team: 1 point, regardless of number of discs 2) The five spots aligned in the center: 1 point per disc 3) The spot farthest from the team: 5 points per disc.
2. Points shall be given regardless of whether the ball is knocked off before or after that disc lands.
3. The score shall be finalized after the referee counts all the discs on the spots without their balls, after the end of the game.

End of the game:

1. Once a team reaches “APPARE!”, the game shall end in that instant.
2. The game shall also end if neither team reaches “APPARE!” and the game time of three (3) minutes passes.
3. The game shall also end if both teams use up the fifty (50) discs without reaching “APPARE!”

Deciding the winner:

The winner shall be decided in the following order of priority:

1) The team who reaches “APPARE!”

2) The team with the higher score.

3) The team with more points from landing on the farthest spot.

4) The team with more spots from which they gained points 7.

5) The team with a higher total score gained from the center spots 6) Judges’ decision.

RETRIES:

1. A retry is allowed only after the referee gives permission upon request from a team member.

2. The team granted a retry shall immediately carry its robot to the Start Zone and begin work there.

3. A team may ask for as many retries as necessary.

4. A team may not load discs during a retry.

5. The team may use discs already loaded on the robot before the retry is granted.

6. The team shall restart after permission from the referee.

VIOLATIONS:

The team who commits the following shall be deemed to be in violation of the rules and subject to a mandatory retry.

1. The robot or a part of the robot comes in contact with the No Contact Area.

2. A team member touches the robot without referee permission.

3. A team makes a false start. Any other acts deemed to be an infringement on the rules.

DISQUALIFICATIONS:

If a team is deemed to have committed the following intentionally, the team shall be disqualified for that game.

- Any acts that pose danger to the game field, its surroundings, the robots, and/or people.

- Use of wind as obstruction, and any other activity that can be judged to have no other purpose than to obstruct the opponent.

- Any act of disobedience against a referee's warning.

- Any other act that goes against the spirit of fair play.

TEAMS:

One (1) representing team from each country or region shall participate in ABU Robocon 2017.

As the host country, Japan shall be represented by two (2) teams.

A team consists of three (3) team members who are students and one instructor, who all belong to the same university/college/polytechnic.
In addition to the above mentioned , three (3) members are allowed to be registered as the pit crew.
The members of the pit crew shall also be students from the same university/college/polytechnic.
The pit crew may assist in the work in the pit area, in carrying the robot from the pit area to the game field, and during set-up.
Graduate students cannot participate.

ROBOT:

Each team may bring one (1) robot only to participate in the contest.

The robot must be hand-built by students from the same university/college/polytechnic.

The robot may be fully automatic or controlled manually. It may be controlled wirelessly or by cable.

The robot must not split into parts during the game.

Robot size:

The robot (excluding the controller and cable) must fit into the Start Zone at the start of the game, including the space above.

Throughout the game, the robot together with any containers used in disc loading shall not exceed length 1500mm x width 1500mm x height 1800mm.

Robot weight:

The total weight of the robot, any containers that will be attached to the robot after disc loading, controller, cables, and any other equipment the team brings for use in the game must not exceed 27.5kg.

Back-up batteries (of the same type as that originally installed in the robot) are exempt.

Power source of the robot:

Each team shall prepare its own power source.

All batteries used in the robot, controller, and any other device used during the game shall not exceed 24V.

The maximum voltage within the circuit(s) shall not exceed 42V.

Teams using compressed air must use either a container made for the purpose, or a plastic soda bottle in pristine condition that is prepared appropriately. Air pressure must not exceed 600kPa.

Any power source deemed dangerous may be banned from use.

Safety:

The robot must be designed and built so as to pose danger to no one, including the team, the opposing team, the people in the surroundings, and the venue.

Safety rules:

The use of the following are prohibited: lead-acid batteries (including colloidal), power sources that involve flames and/or high temperatures, anything that may contaminate the game field, as well as anything that may cause the robots to break down and/or create a situation that hinders the procession of the contest.

If laser is used, it shall be class 2 or less. Full care must be taken not to damage the eyes of anyone in the venue, from the design and practice stages.

Emergency stop buttons must be built on all robots.

1) Specifications: it shall be a red button on a yellow base. It is recommended that teams adhere to ISO 13850, or JIS B 9703. (JIS = Japanese Industrial Standard) 10.

2) Placement: it shall be placed where it is easy to find and activate, so that team members or the referee can stop the robot immediately in an emergency situation.

The referee and organizers will check to make sure the robot meets the safety requirements, and prohibit any team that does not meet them from participating.

APPENDIX:

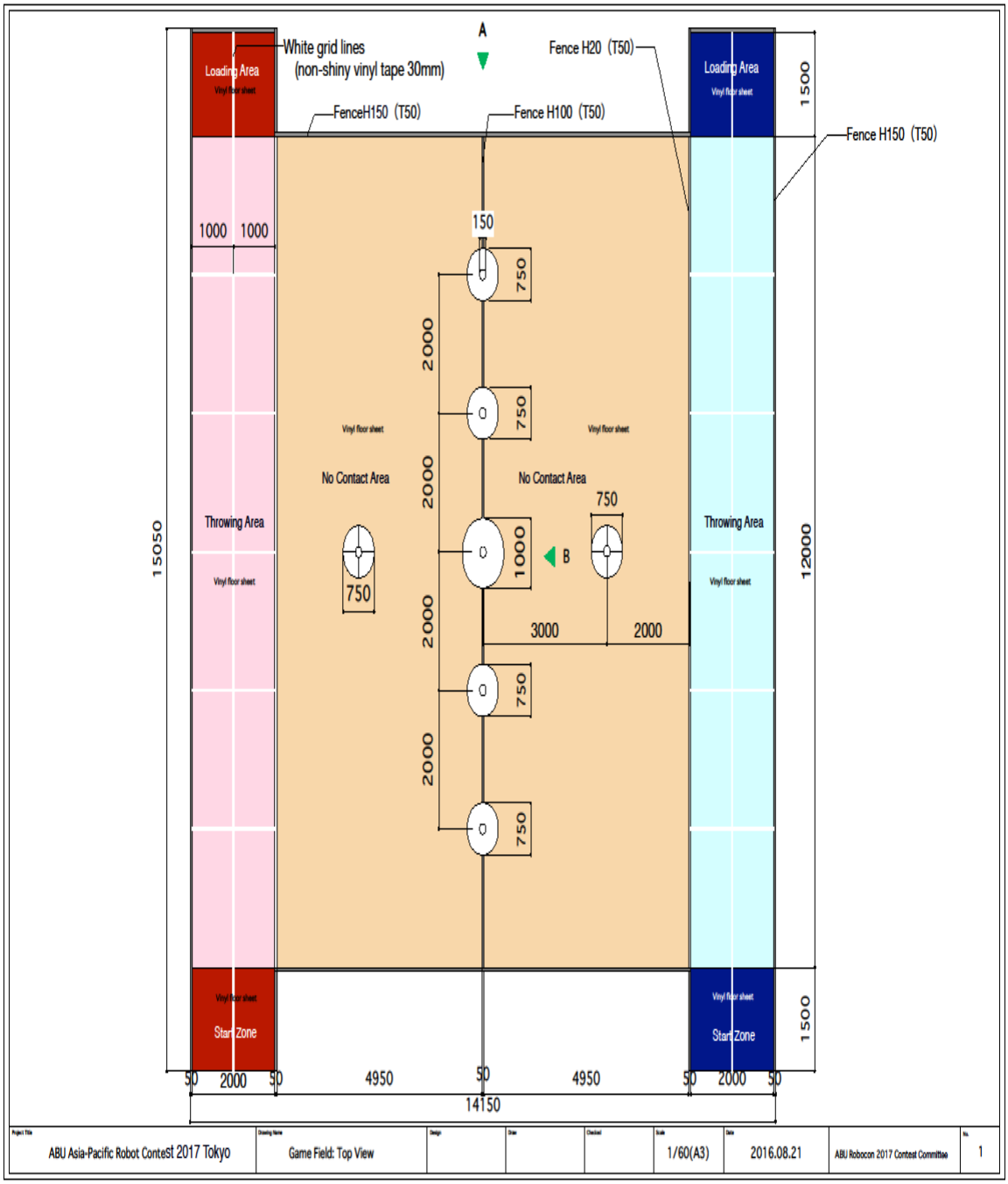
A. MATCHES

The contest is played according to the following format:
League matches: Two for each team
Top 24 teams were selected
Superleague matches: Two for each team
Top 8 teams were selected
Quarter Finals: Knock Out matches
Semi Final: knock out matches
Final: Knock out match

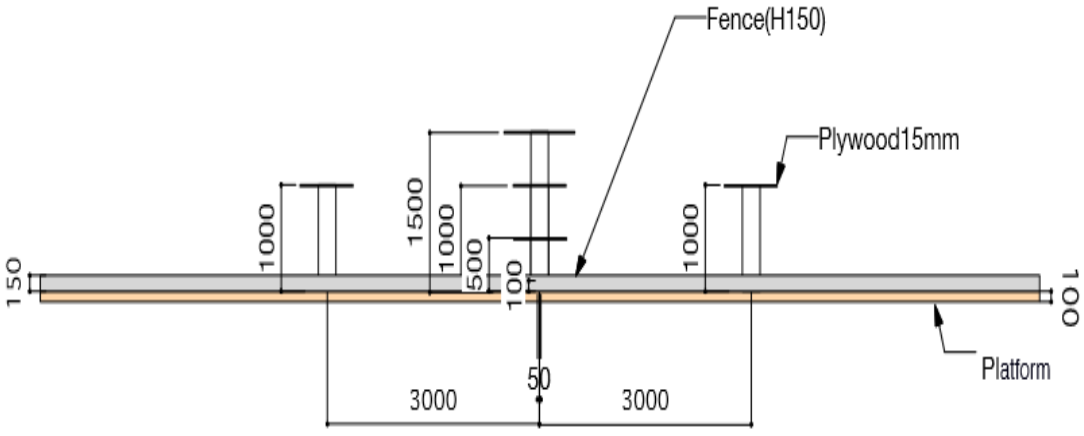
B. AWARDS

Prizes shall include awards for the winners, runner-ups, best idea, best technology, and best design and ABU Robocon award, Sponsors' awards.

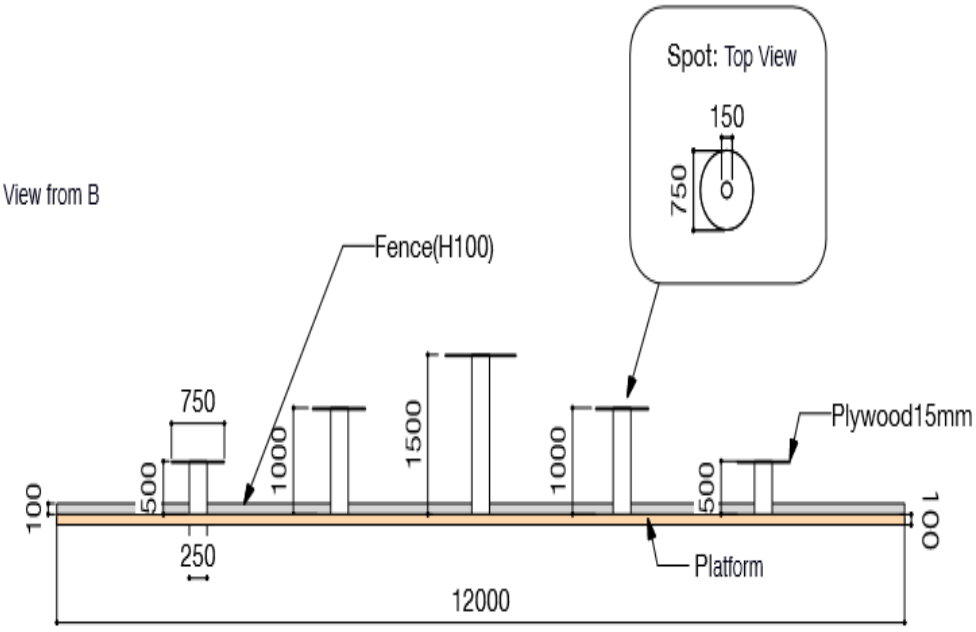
DRAWINGS OF THEME/ARENA:

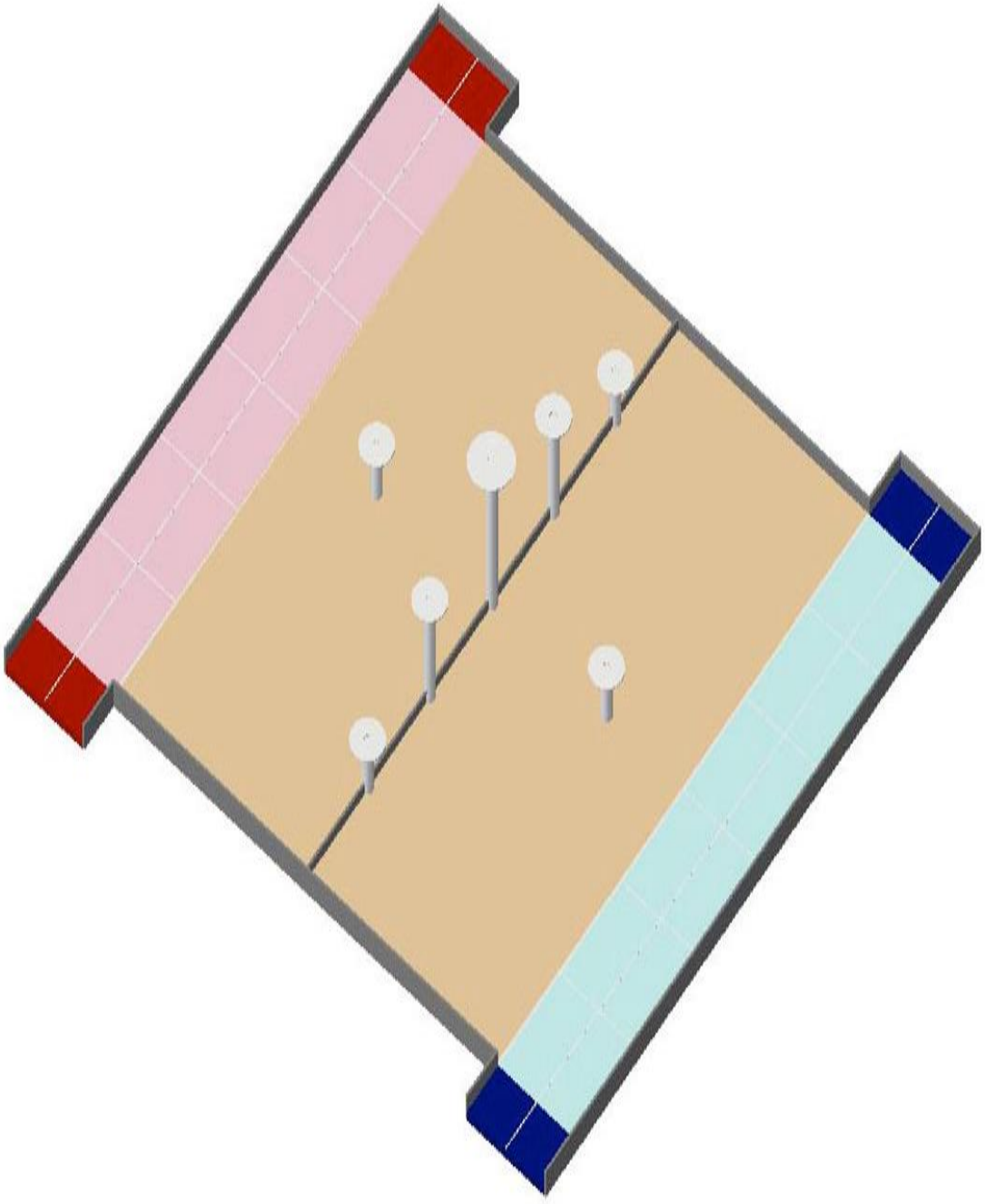


Side View from A



Side View from B





THE MAIN FIELD ARENA

COLOUR SPECIFICATIONS:

1. Game Field Material

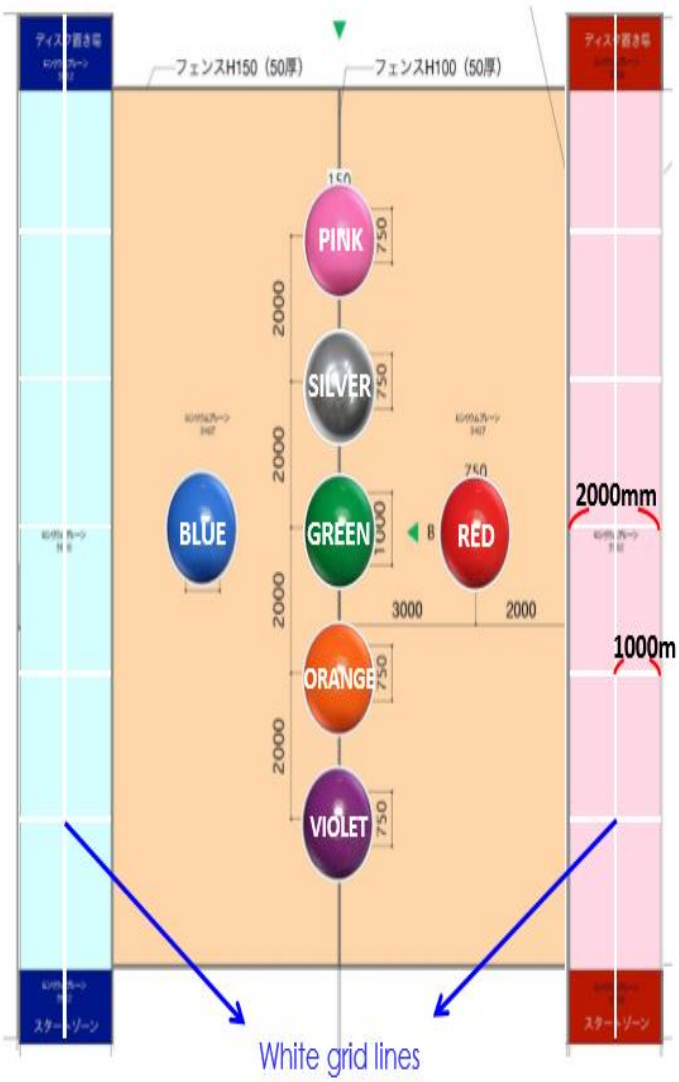
	Material	Color	Color Reference (Product*)
Start Zone, Loading Area	Vinyl floor sheet	Dark red	Pantone 188C (Lonleum Plain 3109)
Start Zone, Loading Area		Dark blue	Pantone 2189C (Lonleum Plain 3612)
Throwing Area		Pink	Pantone 7612C (Lonleum Plain 3102)
Throwing Area		Light blue	Pantone 290C (Lonleum Plain 3610)
No Contact Area		Beige	Pantone 7508C (Lonleum Plain 3407)
White grid lines	Non-shiny vinyl tape	White	
Fence	Wood		
Spot	Plywood	White	
Spot (column)	TBA	White	

***For color reference only.**

Participants and local competition organisers are advised to use vinyl floor sheets available in their country/region, and use above product information as reference only. Lonleum is a product of Lonseal Corporation, available only in select countries.

Note:

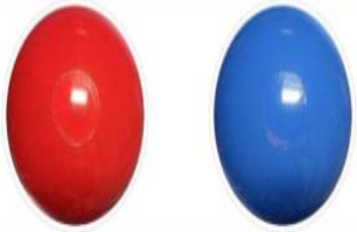
- Information labelled "TBA" will be updated by October, 2016.
- Information on how to secure spots onto the game field will also be released by October 2016.
- Samples of the vinyl floor sheet used in the Throwing Area will be sent to participating broadcasters in due course. Details will be sent to each broadcaster.



Contest Articles

Volley® Soft Saucer (Red, Blue)

Beach Balls (7 colors)



Solid Red	Solid Light Blue	Product
RED (R)	BLUE (B)	Contest color

Product	Solid Pink	Solid Silver	Solid Green	Solid Orange	Solid Purple
Contest color	PINK (P)	SILVER (S)	GREEN (G)	ORANGE (O)	VIOLET (V)

The beach balls should have inflated diameters of approximately 28cm.

THE FRIZZ GUN

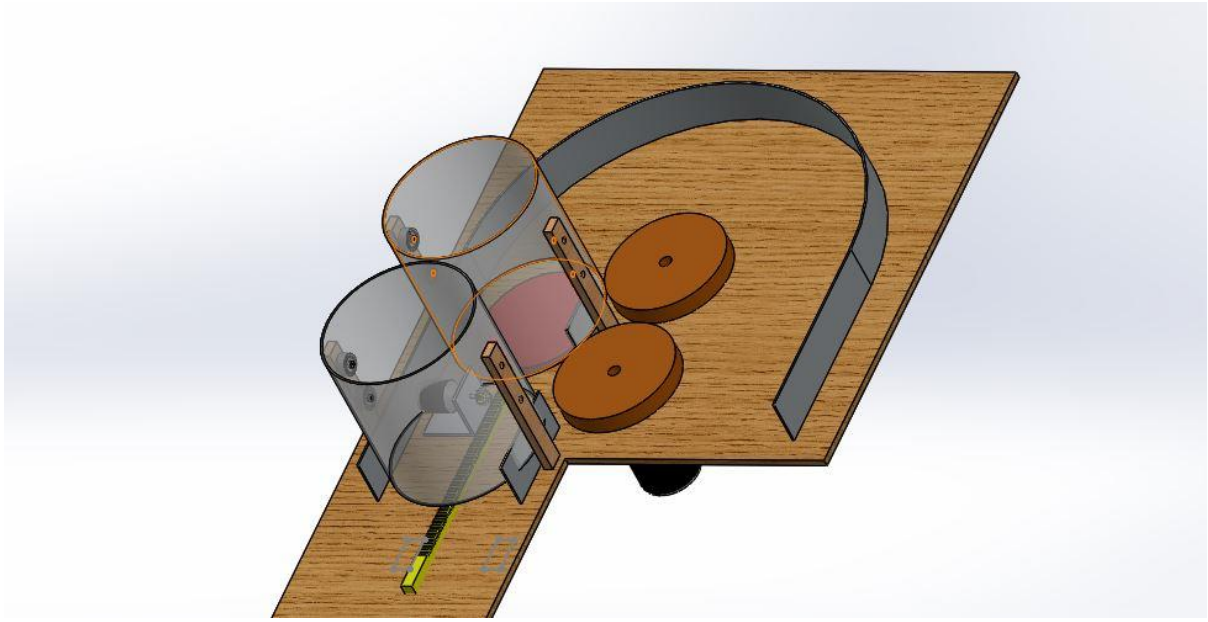
OUR DESIGN AND ANALYSIS:

Different CAD of suggested prototypes:

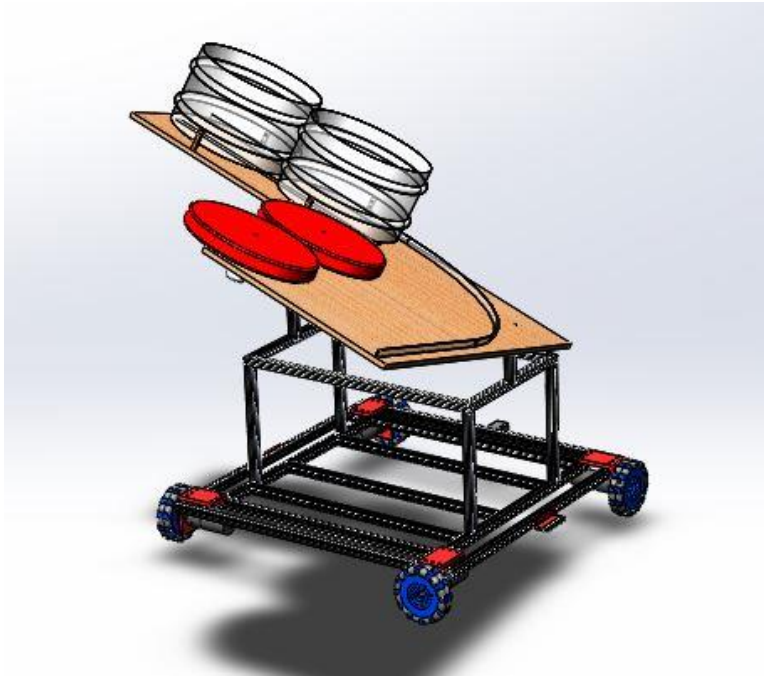
ISOMETRIC VIEW

This was the one of the prototypes that was made initially keeping **Stewart platform** in mind

This CAD model was just before final fabricated model.



This model was made keeping lent bot of FRC and two throwing wheel.



This is final bot cad model

Components used in Final model:

1) Arduino Due
2) Motor driver (MD10C)
3) Motor Driver(MD30C)
4) Rack N Pinion
5) Ball Screw
6) Lipo Batteries
7) Buck Converter
8) PS2 Controller
9) DC Motors
10) Stepper Motor Driver(A4988)
11) Stepper Motor
12) Omni wheels

Hardware and Software Specifications

Mechanical Components

Aluminum profiles

Extrusion is a process used to create objects of a fixed cross-sectional profile. A material is pushed through a die of the desired cross-section. The two main advantages of this process over other manufacturing processes are its ability to create very complex cross-sections, and to work materials that are brittle, because the material only encounters compressive and shear stresses. It also forms parts with an excellent surface finish.

Drawing is a similar process, which uses the tensile strength of the material to pull it through the die. This limits the amount of change which can be performed in one step, so it is limited to simpler shapes, and multiple stages are usually needed. Drawing is the main way to produce wire. Metal bars and tubes are also often drawn.

Extrusion may be continuous (theoretically producing indefinitely long material) or semi-continuous (producing many pieces). The extrusion process can be done with the material hot or cold. Commonly extruded materials include metals, polymers, ceramics, concrete, play dough, and foodstuffs. The products of extrusion are generally called "extrudates".

Hollow cavities within extruded material cannot be produced using a simple flat extrusion die, because there would be no way to support the centre barrier of the die. Instead, the die assumes the shape of a block with depth, beginning first with a shape profile that supports the center section. The die shape then internally changes along its length into the final shape, with the suspended center pieces supported from the back of the die. The material flows around the supports and fuses together to create the desired closed shape.

Aluminium extrusion profile 20x20

 # Omni wheels

Omni wheels or **poly wheels**, similar to Mecanum wheels, are wheels with small discs around the circumference which are perpendicular to the turning direction. The effect is that the wheel can be driven with full force, but will also slide laterally with great ease. These wheels are often employed in holonomicdrive systems.

A platform employing three omni wheels in a triangular configuration is generally called Kiwi Drive. The Killough platform is similar; so named after Stephen Killough's work with omnidirectional platforms at Oak Ridge National Laboratory. Killough's 1994 design used pairs of wheels mounted in cages at right angles to each other and thereby achieved holonomic movement without using true omni wheels.

They are often used in intelligent robot research for small autonomous robots. In projects such as VEX Robotics, Robocon and FIRST Robotics, many robots use these wheels to have the ability to move in all directions. Omni wheels are also sometimes employed as powered casters for differential drive robots to make turning faster. Omniwheels are often used to allow for movement on the horizontal axis on a drivetrain, as well as forward and backward movement. Usually, this is achieved is by using an H-drive.

Omni wheel of diameter 150mm

Knucklejoints

A knuckle joint is used to connect the two rods which are under the tensile load, when there is requirement of small amount of flexibility or angular moment is necessary. There is always axial or linear line of action of load.

The knuckle joint assembly consist of following major components:

1. Single eye.

2. Double eye or fork

3. Knuckle pin.

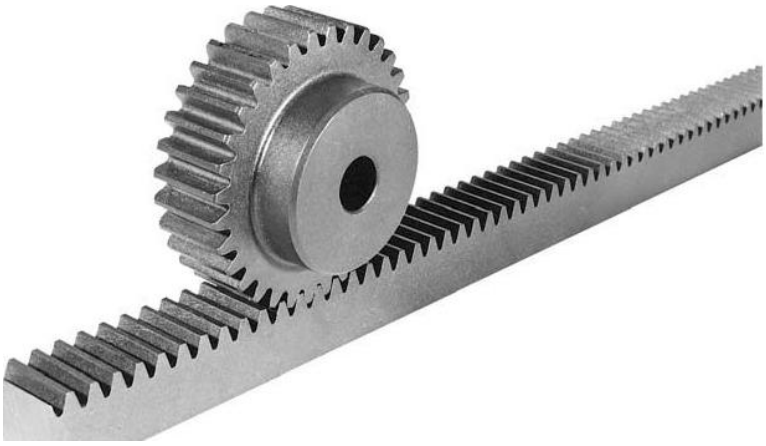
At one end of the rod the single eye is formed and double eye is formed at the other end of the rod. Both, single and double eye are connected by a pin inserted through eye. The pin has a head at one end and at other end there is a taper pin or split pin. For gripping purpose the ends of the rod are of octagonal forms. Now, when the two eyes are pulled apart, the pin holds them together .The solid rod portion of the joint in this case is much stronger than the portion through which the pin passes.

Rack and pinion

A **rack and pinion** is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and forces a train up a steep slope.

For every pair of conjugate involute profile, there is a basic rack. This basic rack is the profile of the conjugate gear of infinite pitch radius (i.e. a toothed straight edge).



A generating rack is a rack outline used to indicate tooth details and dimensions for the design of a generating tool, such as a hob or a gear shaper cutter.

 # Linear bearing and guide rails

A **linear-motion bearing** or **linear slide** is a bearing designed to provide free motion in one direction. There are many different types of linear motion bearings.

Motorized linear slides such as machine slides, XY tables, roller tables and some dovetail slides are bearings moved by drive mechanisms. Not all linear slides are motorized, and non-motorized dovetail slides, ball bearing slides and roller slides provide low-friction linear movement for equipment powered by inertia or by hand. All linear slides provide linear motion based on bearings, whether they are ball bearings, dovetail bearings, linear roller bearings, magnetic or fluid bearings. XY Tables, linear stages, machine slides and other advanced slides use linear motion bearings to provide movement along both X and Y multiple axis.

 # Throwing Motors

In a DC motor, an armature rotates inside a magnetic field. Basic working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motors work in this principle only. Hence for constructing a DC motor it is essential to establish a magnetic field. The magnetic field is obviously established by means of magnet. The magnet can by any types i.e. it may be electromagnet or it can be permanent magnet. When permanent magnet is used to create magnetic field in a DC motor, the motor is referred as **permanent magnet DC motor** or **PMDC motor**. Have you ever uncovered anybattery operated toy, if you did, you had obviously found a battery operated motor inside it. This battery operated motor is nothing but a **permanent magnet dc motor** or **PMDC motor**. These types of motor are essentially simple in construction. These motors are commonly used as starter motor in automobiles, windshield wipers, washer, for blowers used in heaters and air conditioners, to raise and lower windows, it also extensively used in toys. As the magnetic field strength of a

permanent magnet is fixed it cannot be controlled externally, field control of this type of dc motor cannot be possible. Thus permanent magnet DC motor is used where there is no need of speed control of motor by means of controlling its field. Small fractional and sub fractional kW motors now constructed with permanent magnet.

MY6812 12V PMDC motor (3500 rpm)

 # Drive motors

A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed

12V DC geared motor (1500 rpm)

can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universa motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

Ball screw mechanism

A **ball screw** is a mechanical linear actuator that translates rotational motion to linear motion with little friction. A threaded shaft provides a helical raceway for ball bearings which act as a precision screw. As well as being able to apply or withstand high thrust loads, they can do so with minimum internal friction. They are made to close tolerances and are therefore suitable for use in situations in which high precision is necessary. The ball assembly acts as the nut while the threaded shaft is the screw. In contrast to conventional leadscrews, ballscrews tend to be rather bulky, due to the need to have a mechanism to re-circulate the balls.

Another form of linear actuator based on a rotating rod is the threadlessballscrew, a.k.a. "rolling ring drive". In this design, three (or more) rolling-ring bearings are arranged symmetrically in a housing surrounding a smooth (thread-less) actuator rod or shaft. The bearings are set at an angle to the rod, and this angle determines the direction and rate of linear motion per revolution of the rod. An advantage of this design over the conventional ballscrew or leadscrew is the practical elimination of backlash and loading caused by preload nuts.

Microcontroller and Drive circuits

The Arduino Due is a microcontroller board based on the Atmel SAM3X8E ARM Cortex-M3 CPU. It is the first Arduino board based on a 32-bit ARM core microcontroller. It has 54 digital input/output pins (of which 12 can be used as PWM outputs), 12 analog inputs, 4 UARTs (hardware serial ports), a 84 MHz clock, an USB OTG capable connection, 2 DAC (digital to analog), 2 TWI, a power jack, an SPI header, a JTAG header, a reset button and an erase button.

Warning: Unlike most Arduino boards, the Arduino Due board runs at 3.3V. The maximum voltage that the I/O pins can tolerate is 3.3V. Applying voltages higher than 3.3V to any I/O pin could damage the board.

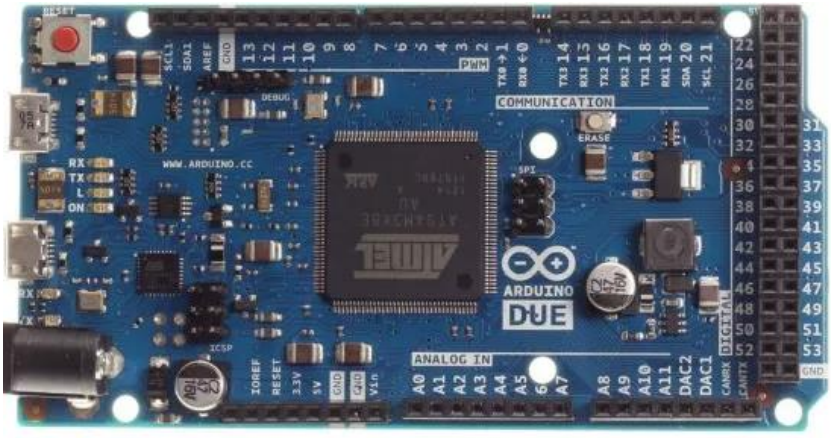
The board contains everything needed to support the microcontroller; simply connect it to a computer with a micro-USB cable or power it with a AC-to-DC adapter or battery to get started. The Due is compatible with all Arduino shields that work at 3.3V and are compliant with the 1.0 Arduino pin out.

The Due follows the 1.0 pin out:

- **TWI**: SDA and SCL pins that are near to the AREF pin.

- **IOREF**: allows an attached shield with the proper configuration to adapt to the voltage provided by the board. This enables shield compatibility with a 3.3V board like the Due and AVR-based boards which operate at 5V.
- An unconnected pin, reserved for future use.

Atmel SAM3X8E ARM Cortex-M3 CPU



 # A4988 Stepper motor driver

A4988 is a carrier board or breakout board for Allegro's A4988 DMOS Microstepping Driver with Translator and Over current Protection; we therefore recommend careful reading of the A4988 datasheet(1MB pdf) before using this product. This stepper motor driver lets you control one bipolar stepper motorat up to 2 A output current per coil (see the *Power Dissipation Considerations* section below for more information). Here are some of the driver's key features:

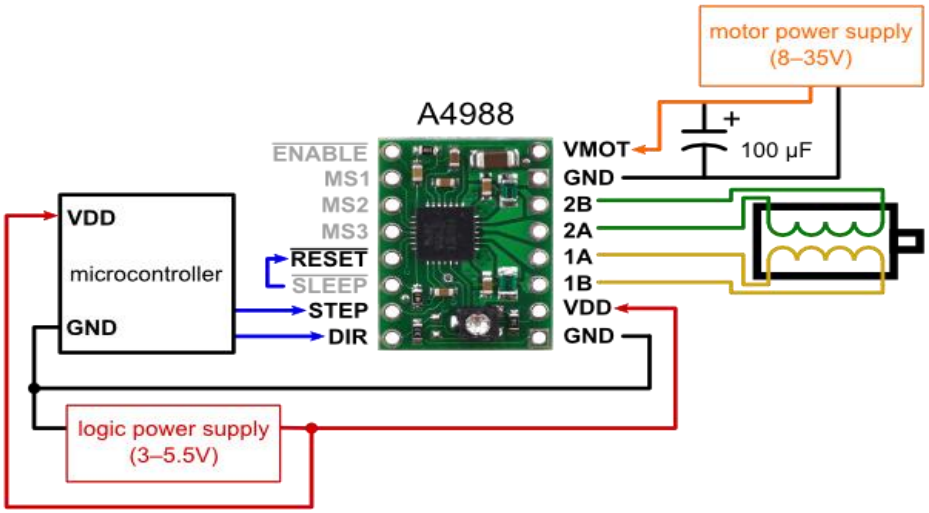
- Simple step and direction control interface
- Five different step resolutions: full-step, half-step, quarter-step, eighth-step, and sixteenth-step
- Adjustable current control lets you set the maximum current output with a potentiometer, which lets you use voltages above your stepper motor's rated voltage to achieve higher step rates
- Intelligent chopping control that automatically selects the correct current decay mode (fast decay or slow decay)
- Over-temperature thermal shutdown, under-voltage lockout, and crossover-current protection
- Short-to-ground and shorted-load protection

This product ships with all surface-mount components—including the A4988 driver IC—installed as shown in the product picture.

This product ships individually packaged with 0.1" male header pins included but not soldered in; we also carry a version with male header pins already soldered in. For customers interested in higher volumes at lower unit costs, we offer a bulk-packaged version without header pins and a bulk-packaged version with header pins installed.

Note that we carry several stepper motor drivers that can be used as alternatives for this module (and drop-in replacements in many applications):

- The Black Edition A4988 stepper motor driver carrier is available with approximately 20% better performance; except for thermal characteristics, the Black Edition and this (green) board are interchangeable.



Drive circuit for stepper motor NEMA 23

 # Cytron motor driver MD30C

MD30C is the successor of MD30B which is designed to drive medium to high power brushed DC motor with current capacity up to 80A peak and 30A continuously. Fully NMOS design not only provides faster switching time, it is also more efficient and no heatsink or fan is required.

Besides that, MD30C also incorporates some user friendly features such as reverse polarity protection and onboard PWM generator which allows it to operate without a host controller. The motor can simply be controlled with the onboard switches and speed potentiometer. External switches and potentiometer can also be used.

Drive circuit for PMDC motors 30 amps

 # Cytron Motor Driver MD10c

MD10C is a newer version of the MD10B which is designed to drive high current brushed DC motor up to 13A continuously. It offers several enhancements over the MD10B such as support for both locked-antiphase and sign-magnitude PWM signal as well as using full solid state components which result in faster response time and eliminate the wear and tear of the mechanical relay.

Drive circuit for DC geared motors 10 amps

 # Buck Converters

A **buck converter** (**step-down converter**) is a DC-to-DC power converter which steps down voltage (while stepping up current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).

Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that lower voltages by dissipating power as heat, but do not step up output current.

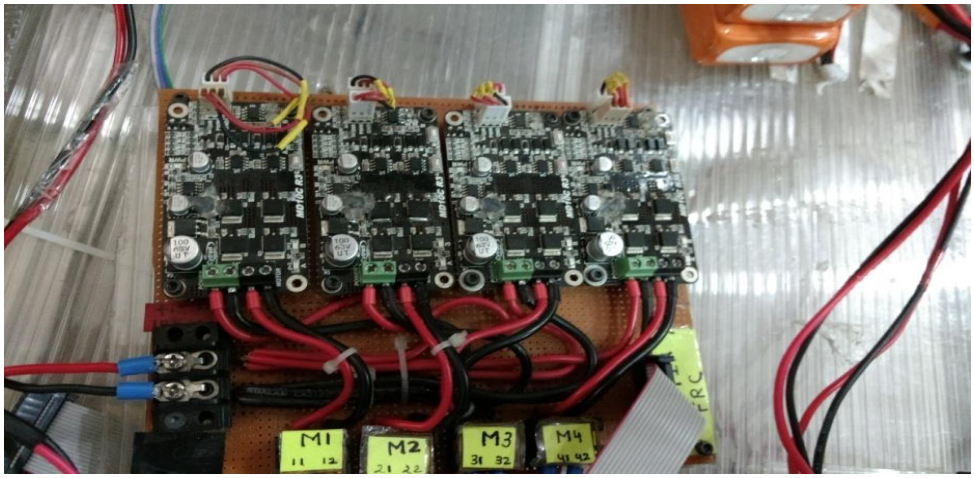
XL4015 5a DC-DC step down buck convertor

Sensors

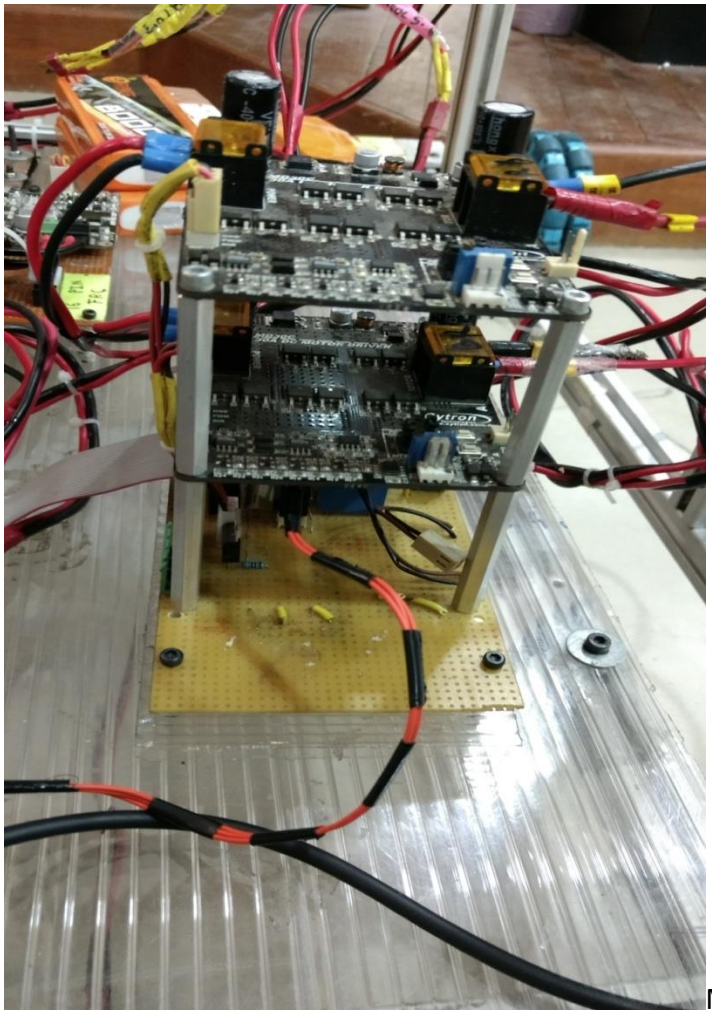
LSA08 (Advance Line Following Sensor Bar) consist of 8 sensors pair. LSA08 is typically used for embedded system or robots for line following task. The specially selected wavelength of **super bright green LED** as the sensor's transmitter enables LSA08 to operate on various different colour surfaces. LSA08 is capable to operate on surface with colour of Red, Green, Blue, White, Black, Gray and possibly other colours with distinct brightness different. LSA08 has several different output modes, for the convenience of use for any system. Namely, the digital output port (8 parallel output line), the serial communication port (UART) and the analog output port.

LSA08 line following sensor array (IR sensor)

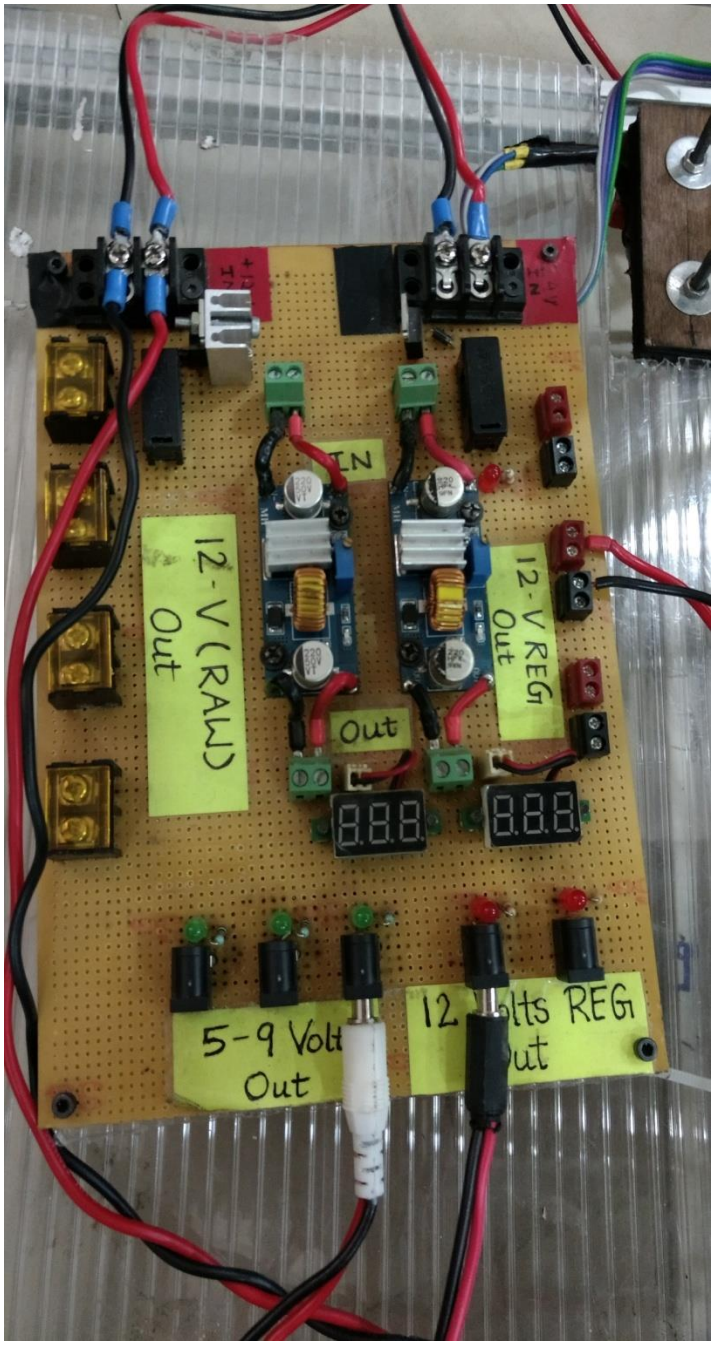
PICTURES OF CIRCUIT BOARDS:



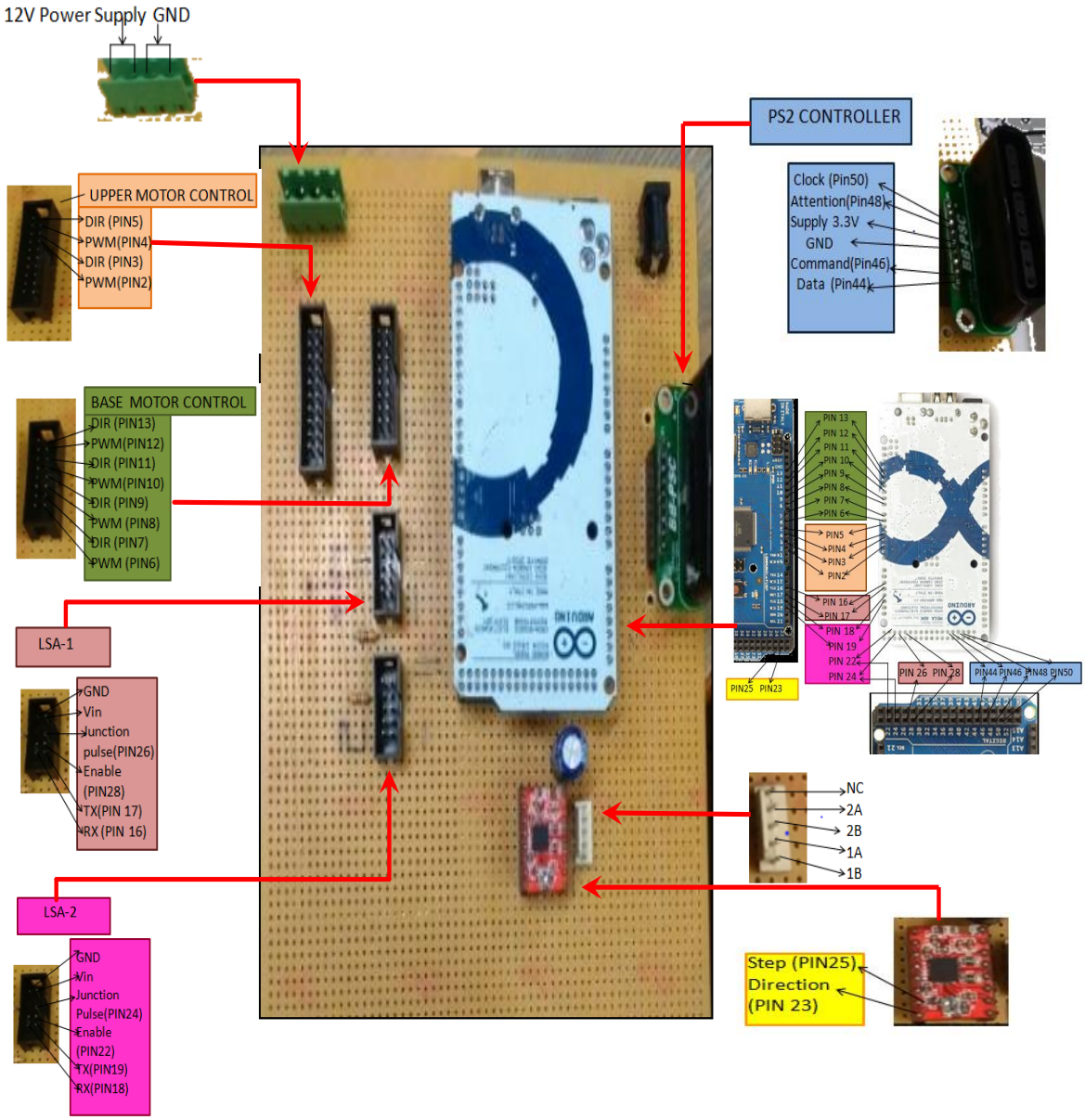
MD 10C BASE MOTOR DRIVER BOARD



MD30C THROWING MOTOR DRIVERS



POWER SUPPLY BOARD WITH BUCK CONVERTERS



MAIN CONTROLLING BOARD WITH DIFFERENT SIZE CONNECTORS FOR EASY PURPOSE RECOGNISATION

WORKING:

In this we have used Arduino Due as the Microcontroller.

2 Motor drivers MD30C used for upper motor control. One Buck convertor were used in power supply circuit to convert 24volts to constant 12volts and other was used to convert 12volts to constant 5volts.

4 MD10C Motor drivers used for base motor control

Rack N Pinion Assembly was used in throwing mechanism to make the striker hit the Frisbees inside the stack.

Ball Screw was used to provide PAN to the bot and stepper motor was used for controlling Ball Screw movement.

PS2 Controller was used for controlling bot base movement and pan movement.

Different orientations of omni wheels used in drive train made its movement a lot more easier.

PROPOSED METHODOLOGY:

After going through the rulebook and properly analyzing the theme we started watching different videos and collecting related information that helps a team in beating the challenges. After going through all this, our first focus was to make an effective drive train so that we can cover the distance to loading area in a time as minimum as possible. We make drive train with the help of omni wheels whose special orientations helped us in beating all the challenges of moving drive train and with this we have completed our first task. After this we started searching for various mechanisms that can be used for different functions of the robot.

This year the two main mechanisms to be taken into account were loading mechanism and throwing mechanism.

We focused on getting proper throwing mechanism, to get a perfectly working throwing mechanism we again started watching different videos, doing brainstorming, adopting different mechanism and testing them by making different prototypes. With each prototype we came to know about our faults and with each new prototype we solve our fault and beat the challenge. The first prototype we took over was based on wheel. Then arise the need for an appropriate Motor for it and it was MY6812 can be called boon for this year's ROBOCON. With the help of this we have our prototype of throwing mechanism using two wheels moving with the help of motors to throw the disc. Now we started experimenting with our prototype and the spectrum

of experimentation narrowed down to finding appropriate roll, pitch, RPM, pan and a search for the strategy. we have attain all these facts with the help of practices, observations and calculations .For giving PAN we have used ball screw that help us in attaining proper angle for throwing .

After this we focused on our loading mechanism, we again started having different prototypes for loading and we end up with using rack and pinion arrangement for that. We had two stacks for holding the disc and a striker that moves with the help of rack and pinion that strikes or hit the discs in the stacks. With this we ended up with our working prototype of the loading mechanism.

Now was the time for putting all the prototypes, circuits, drive train and designs into a single piece of working machine our robot for ROBOCON'17, **THE FRIZZ GUN**. The suitable mechanical structures as per the prototypes were adopted and worked giving out the final design, putting all together and testing on our practice arena we finalized our design and the working machine for the competition. Then we started practicing with it analyzing suitable angle, RPM and PAN.

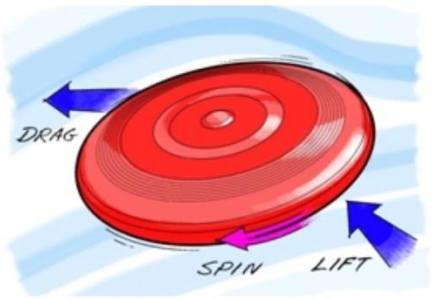
TESTING

Phase I

We started our testing from Oct 17 2016. We made our first throwing board with wooden planks and boards . Motor used was MY6812 which is a PMDC motor with 3500 no load rpm.
We are able to achieve the distance of 8m meters but unable to make frisbee land on the platform.

First prototype developed in Oct 2017 with a single wheel

After few days of testing and experimentation we realized that by keeping angle of throwing board close to zero degree we will not able able to land the Frisbee . Two key forces that act on a Frisbee during flight are lift and drag. Lift is the force that allows the Frisbee to stay airborne, and in flight it opposes the force of gravity on the disk's mass. The Frisbee itself creates this lift force as it flies through the air. Because of the Frisbee's curved shape, the airflow above it must travel at a higher velocity than that underneath, thereby creating low pressure above and high pressure below the disk. This pressure difference provides the lift. Drag is a resistant force on the Frisbee, perpendicular to the lift, and it acts against the disk's movement through the air. The angle at which the Frisbee is thrown, which we'll call the "launch angle" (aka the angle of attack), affects both lift and drag.



Second prototype developed in Nov 2017 with a single wheel

Phase II

After initial experimentation we realized that we have to give some initial angle close to 33 degrees with respect to ground then only I can achieve a landing motion. To fly well, the Frisbee needs enough lift, and not too much drag. When the Frisbee is thrown tilted downward, it does not have much lift and so it quickly falls to the ground. When the Frisbee is thrown relatively horizontal, it has a good amount of lift and consequently should fly relatively far—at least much farther than when the Frisbee was thrown tilted down. When an even larger launch angle is used, the Frisbee has more lift. You may have noticed, however, that although the Frisbee thrown upward flew relatively high, it probably stalled out rather abruptly near the end of its flight. This may have caused it to land gently and/or quickly go off to the side. Of the three launch angles tested in this activity, the horizontal launches probably resulted in the overall "best" Frisbee throws in terms of distance and straightness.

Second prototype developed in Nov 2017 with a single wheel and elevation

After months of testing and experimentation we got our final tilts angle at which our Frisbee lands successfully.While in flight, our frisbee will experience several forces governing its movement including gravity, lift, drag, and a torque from its angular momentum. First off, Gravity is the most obvious and intuitive of these forces. Everything is pulled towards the earth's center of mass by gravity at about 9.81m/s/s. If we just place the frisbee on the table, it will experience a force resulting from the acceleration of gravity. If we drop it, it will be accelerated downward. The velocity of falling objects has been fully investigated and we won't go into that too deeply. For now, simply assume that we could calculate the velocity of a dropped object or calculate the acceleration of an object if we know its fall rate.

Lift is what may be the most important force in this study. Believe it or not, a frisbee experiences lift following the same principles as a traditional wing or rotor blade. As the frisbee

cuts through the air, some of the oncoming air goes over the frisbee, some goes under. The air streams have to meet up in the lee of the frisbee and since we cannot create or destroy air, we must have continuity and conservation. The air on top has to move faster for this to hold, it has longer to travel after all, and the air below can move more slowly. Thanks to Bernoulli's principle, we know that air moving faster will have a decreased pressure. This isn't anything new; in fact, Daniel Bernoulli published this idea in 1738! With fast air on top of the frisbee and slower air below, there is high pressure below and low pressure above the disk. From a difference in pressure we get the force of lift (more generally called a pressure gradient force).

Final Testing in the practice arena at chattrapatishivaji stadium on 1 march 2017

Robots can be either mobile or stationary. Mobile robots include rolling robots, crawling robots, swimming robots and many more. Stationary robots include robot arm, robot face, industrial robots etc. Although known as stationary, these robots are not actually motionless, but are confined to a small boundary. Each of these robots are designed to work on different platforms and the most common ones work either on Land, Air, Water, space etc. Some of the robots are designed to work on more than one platform and can shift from land to water to air. Based on

the way robots move, they can be further classified as "**Holonomic**" or "**Non-Holonomic**" drive Robots

Holonomic refers to the relationship between controllable and total degrees of freedom of a robot. If the controllable degree of freedom is equal to total degrees of freedom, then the robot is said to be Holonomic. A robot built on castor wheels or Omni-wheels is a good example of Holonomic drive as it can freely move in any direction and the controllable degrees of freedom is equal to total degrees of freedom. The image shows a castor wheel which can rotate in both X-axis and Y-axis making it move in both the directions

Testing of Holonomic drivetrain and line following algorithm Jan 14,2017

BEFORE LEAVING FOR PUNE:

We had our bot ready before we left for pune. The few days before leaving for pune were very important. Days and night efforts of the team made it possible. The main problem with us was that we did not had much time for practice but learning from past experience we managed somehow to get 1 day and 2 night practice.

REACHING PUNE:

After the long and enjoyable journey, we finally reached the 7th most populous city, Pune. The host of the international event was there at the railway station to receive us. Quarter of our team went with the packed robot to pit area. Pit area is the small working area assigned to every team where they could assemble their bots. Rest of the team members went to complete all the formalities related to lodgings, etc. And then get ready to reach the pit area. The robot was unpacked till all the team reached the pit. Now the time was to assemble the bot. So, the actual work began at around 2pm.

The first practice slot allotted to us was at 6.45. we did not performed well due to lack of practice but the next slot of 3.10 a.m went really good. Then our 3rd practice slot also goes good then the time for our match against Marwadi Education Foundation as we won the match we went for further practice slot then we played against MIT Manipal and won the match. Then we waited for the result and after entering in the Super League we went for practice in practice arena and then got ready for the matches against IIT Delhi and GCOER. We played well against both of them but unfortunately can't make it to enter under the Top 8 Teams.

Now the event was over for us and we were ranked 17th among the 112 teams. COEP won the Final round.

EVENT SUMMARY:

1) The National ABU ROBOCON 2017 was held at MIT PUNE on March 2, 3 and 4. The theme for Robocon 2017 declared by JAPAN. The theme revolves around the word "ASOBI" (play), which is also a fundamental philosophy behind Robocon.

In "ASOBI," playful, unique, original show of skills is often more important than winning or losing, as everyone – friend and foe alike – can applaud and enjoy them.

2) Each game will be conducted between two teams, each with one (1) robot.

3) After the start of the game, the team may load discs onto its robot once the robot reaches the Loading Area.

4) The robots of both teams may throw discs at any ball on any spot to knock the balls off the spots.

5) Scores will be counted when a team's disc lands on a spot where its ball has been knocked off.

6) When all the balls have been knocked off of their spot and a team successfully lands its discs on all the spots, that team reaches "APPARE!", and is declared the winner of the game.

7) If neither team reaches "APPARE!", and either both use up the fifty (50) discs or the game time of three (3) minutes passes, the game shall end. The winner will be decided by who has the higher score at the said end of the game.

8) In league matches we had our first match against Marwadi Education Foundation and second match against MIT, Manipal and we won against both of them.

9) In the super league we had our matches against IIT DELHI and Government College of Engineering and Research, Awsari, PUNE. We scored 10 points against IIT Delhi and 8 points against GCOER, Pune.

10) COEP did APPARE in the final match and became National Winner of ABU Robocon 2017 MIT PUNE was the runner up.

PROBLEMS FACED:

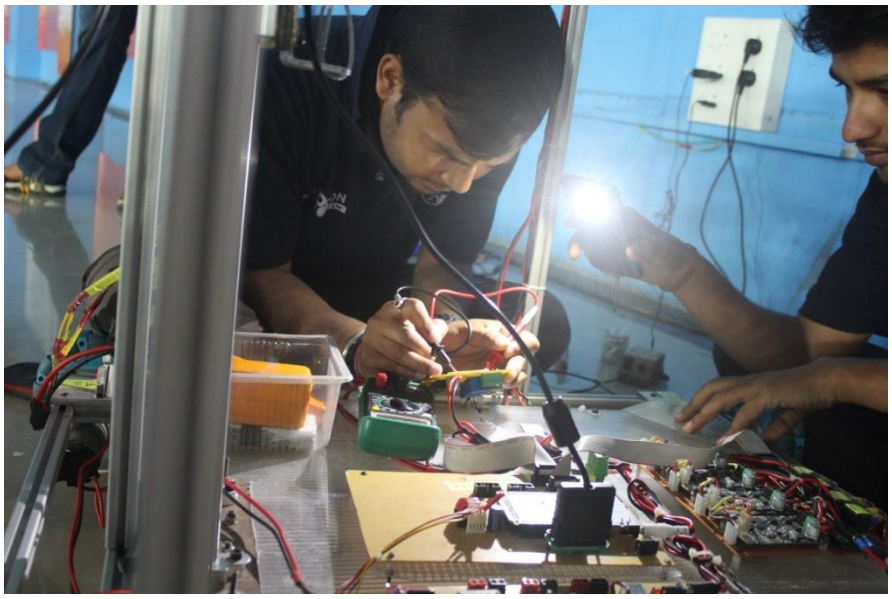
1. Initial BOM procurement was very late.
2. Not many prototypes/designs were made. Inspite of finding this problem last year, we still stuck with same design with what we have started.
3. Although we have started our preparation early this year, still because of some reason or other, we completed our bot in last week of February, just 2 days before going to pune.
4. Bot chasis was not very stable. Many effort were made to improve it to some extent but at last aluminium welding proved to be good remedy.
5. Not much thought was given to loading which ultimately proved to be problem causing factor till last.

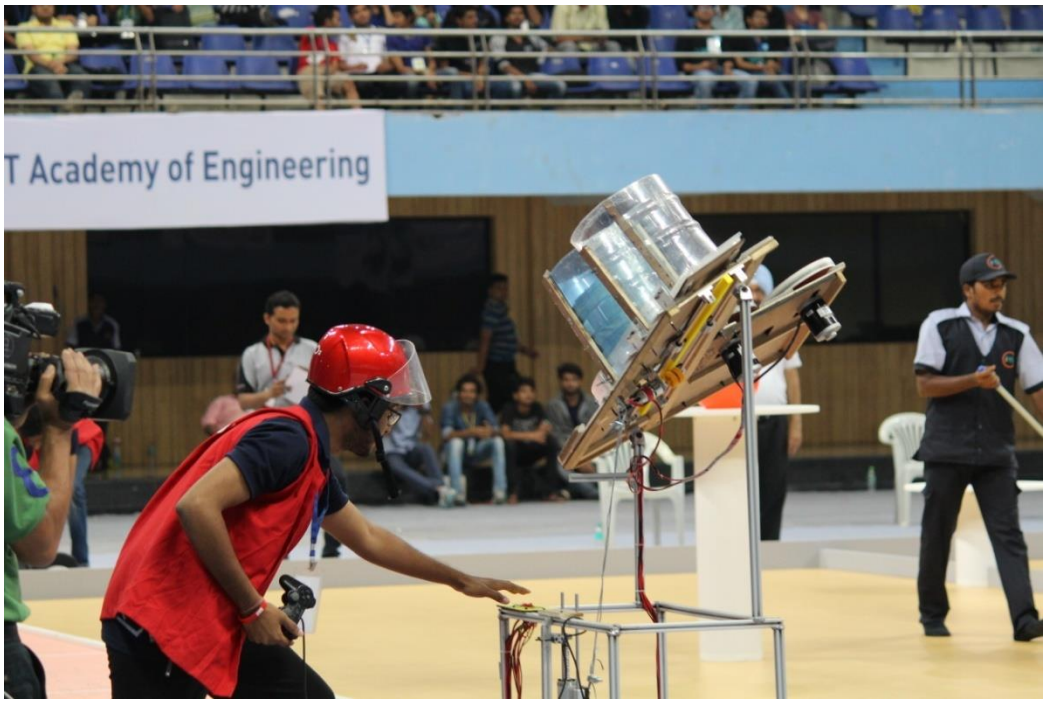
6. Some minor problems were faced due to cross-connection in motor driver which may have cause serious problem.(MOTOR DRIVER CONNECTION SHOULD BE TWICE CHECKED)
7. Space for practice was given very late.

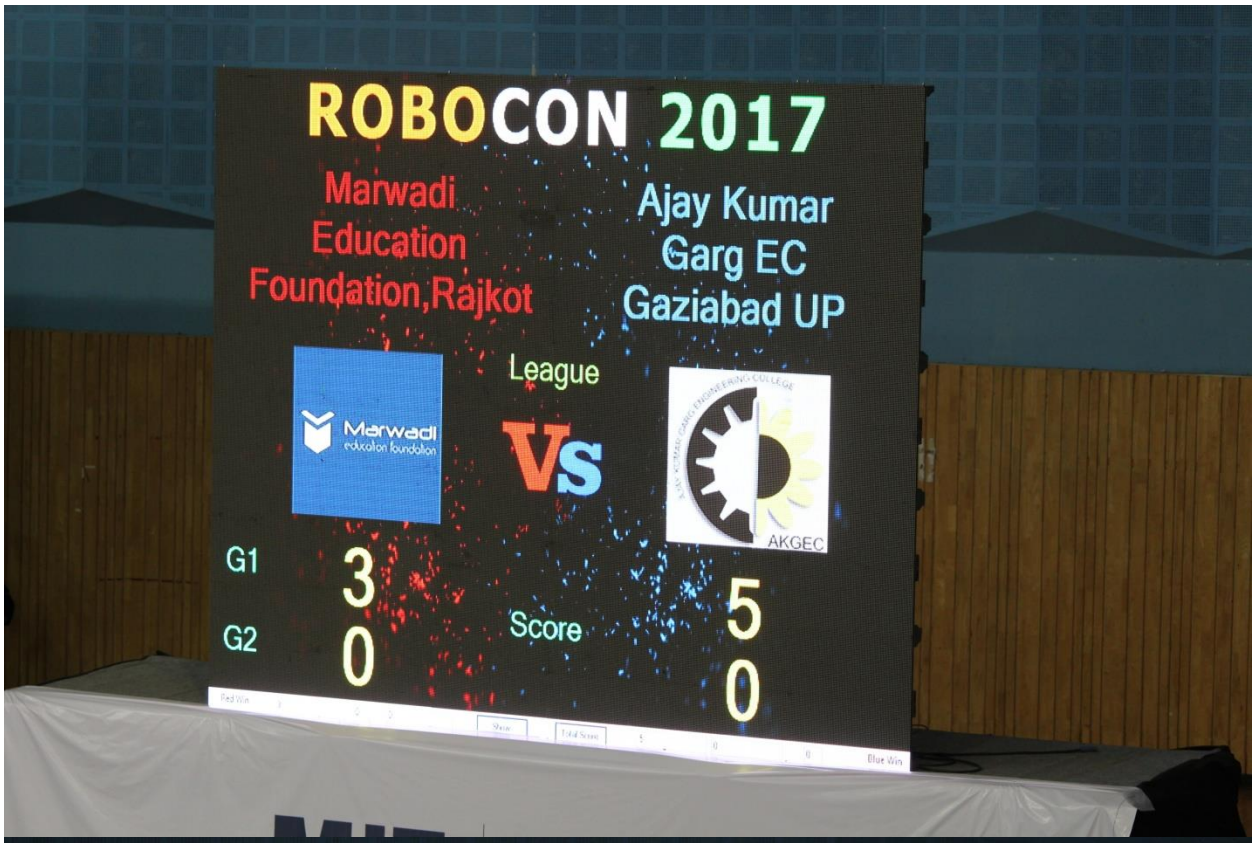
OUR ACHIEVEMENTS:

1. For the first time in history of TEAM ROBOCON AKGEC, we have qualified for **SUPER LEAGUES, among Top 24**.
2. We ranked **AIR 17** among all 112 teams from all over India.
3. All parts of robot worked properly and perfectly.
4. We won all matches from both the teams in league round.
5. TEAM ROBOCON AKGEC for the first time got interviewed live on DOORDARSHAN.
6. ROBOCON 1/1 match strategy includes both making our points and decreasing others. Later was ignored by all the contestants. We won the match against GCOER, Avsari, Pune, by utilizing this specific point. With one hit by our disc to a pile of 3 opponent's discs carrying 5 points each, we ourselves secured one 1 point by decreasing 15 theirs.
7. We even won, one of our super league match against IIT DELHI, with such an excellent strategy that many well known teams like COEP, KIET, ABES, NIRMA have cheered for us.
8. This boosted our team's confidence.
9. Once again 2015 history got repeated, Manipal Institute lost again.

PICTURE GALLERY ROBOCON2017@PUNE




T Academy of Engineering


ROBOCON 2017
Marwadi Education Foundation,Rajkot
Ajay Kumar Garg EC Gaziabad UP
League
Vs
Marwadi education foundation
AKGEC
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3
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G2
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Score
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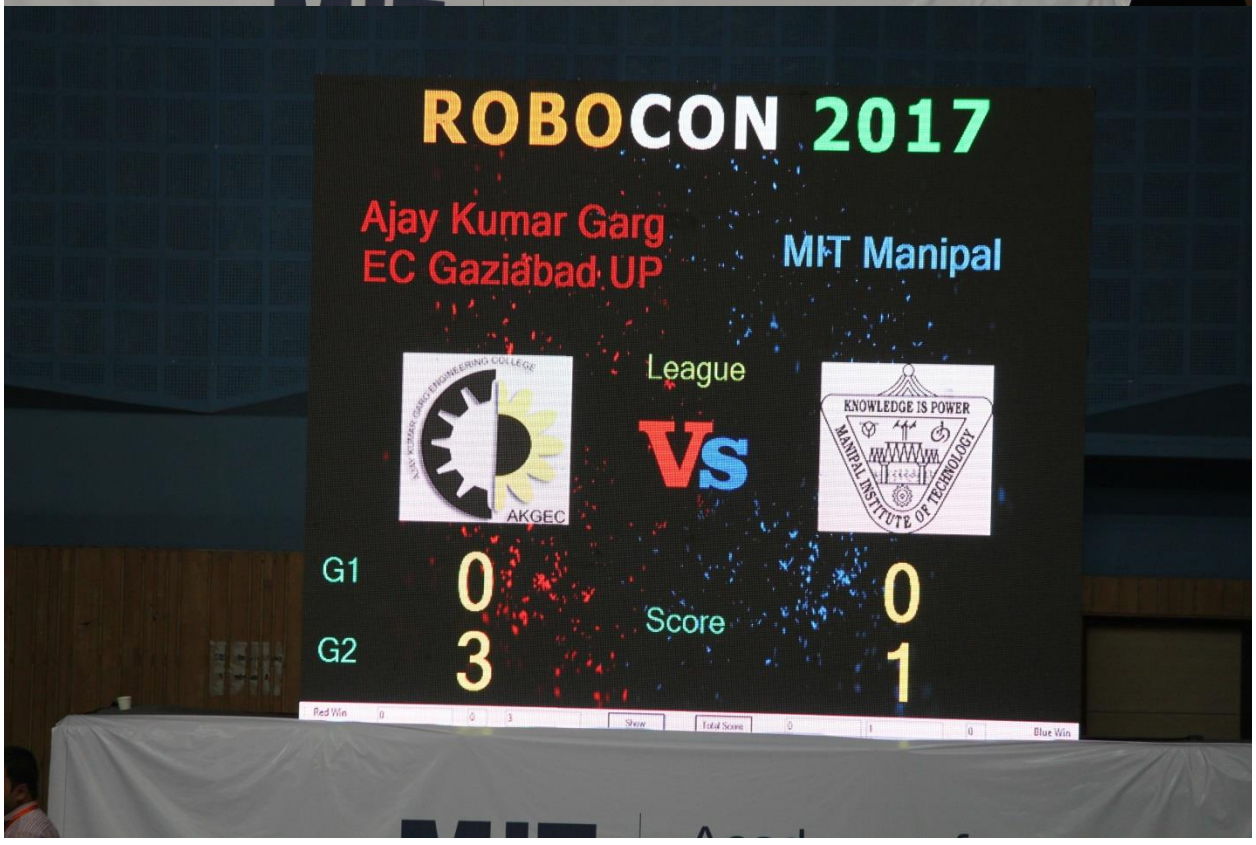
ROBOCON 2017
Ajay Kumar Garg EC Gaziabad UP
MIT Manipal
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Vs
AKGEC
KNOWLEDGE IS POWER
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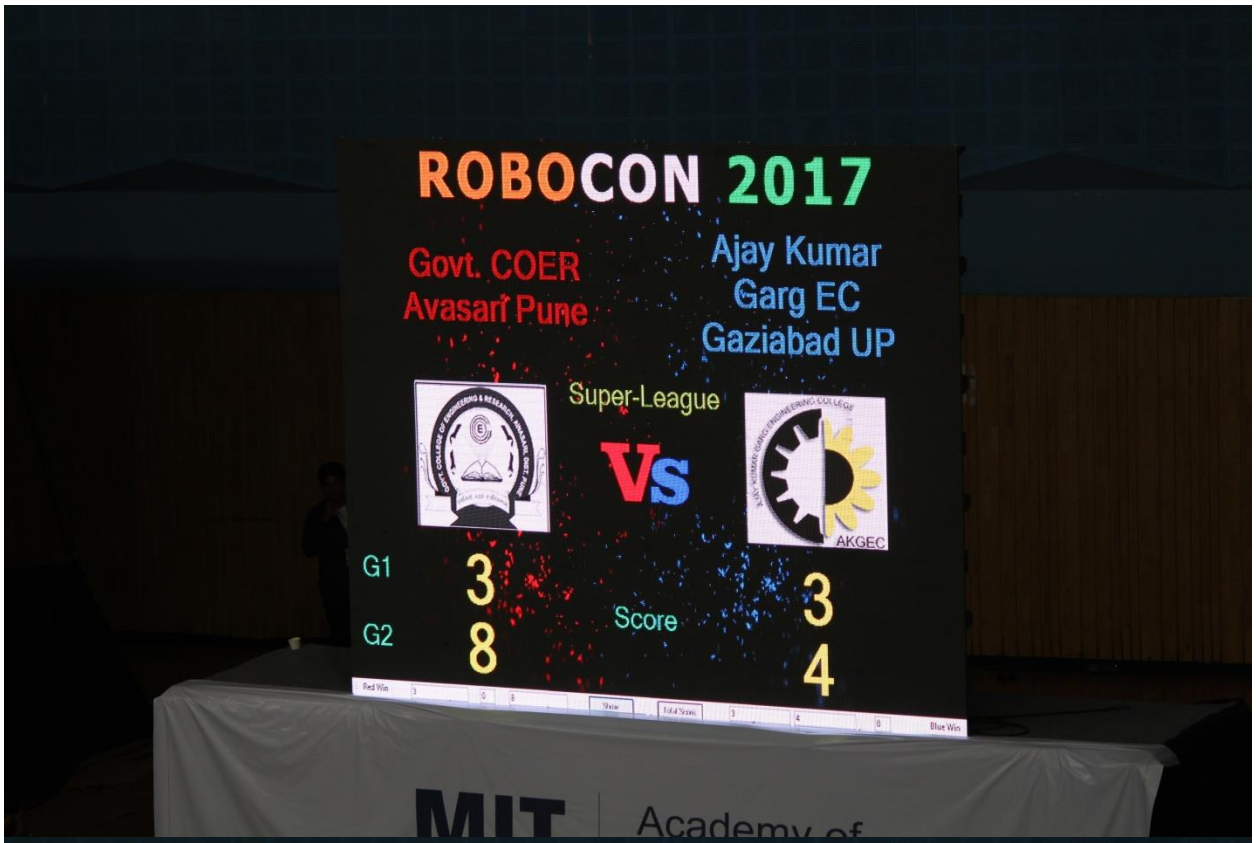
ROBOCON 2017
Govt. COER
Avasari Pune
Ajay Kumar
Garg EC
Gaziabad UP
Super-League
Vs
AKGEC
G1
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G2
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Score
4
MIT
Academy of


ROBOCON 2017
Ajay Kumar Garg
EC Gaziabad UP
IIT Delhi
Super-League
Vs
AKGEC
G1
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14
G2
10
Score
6
MIT
Academy of

Conclusion:

A newly started venture is always the harbinger of opportunity for success as well as a way to learn and mend the ways thus instigating improvisation.

This year robocon was the best journey for AKGEC ROBOCON Team till yet .We managed to occupy 17th position among 112 teams across the nation and also defeated the some well known teams of Robocon. But this is just the start, there is lot more to achieve in this field. This experience boosted our confidence level and also motivated us to go beyond this.

LESSONS LEARNT

Team spirit:
Team spirit is the most important thing and a major factor too for the success of the team. At nights when other team members worked, hardly any one of us went to hostels to sleep. We used to sleep on the arena made in front of the club when it became impossible for us to keep our eyes open. This helped a lot in motivating others to keep working.

Time Management:
Time management plays an important role for the success of any event. If we could have practiced more we must have performed better. So this is one of the areas to be worked on.

EXPERIENCE:
To be a best team we need to have experience and this reflected in this year's performance as we are improving year by year. The experience we got from this year will surely take our performance to a new level in the coming years.

APPENDIX- 1

AKGEC ROBOCON TEAM 2017					
Main members					
S.No.	**Name**	**Discipline / Year**	**University Roll No.**	**Email ID**	**Mobile No.**
1	SHUBHAM CHOUDHARY	EN/4th YEAR	1302721088	shubhkumar101@gmail.com	9810477629
2	SHARAD GUPTA	ME/4th YEAR	1402740926	1995sharad@gmail.com	7417960177
3	PRINCE AGARWAL	EC/4th YEAR	1302731106	prince.agarwal1517@gmail.com	8285017133
4	RISHABH KANOJIA	EN/4th YEAR	1302721076	rishu.kano@gmail.com	8800765766
5	RAHUL GAUTAM	EC/4th YEAR	1302731112	rahulgtm38@gmail.com	8287986414
6	SANDESH SINGH	EN/3rd YEAR	1402721080	sandeshsingh5688668@gmail.com	7065210482
7	VAIBHAV SINGH	ME/3rd YEAR	1402740173	vaibhavsingh695@gmail.com	9891779184
8	UJJWAL BARANWAL	EC/3rd YEAR	1402731159	baranaryan2509@gmail.com	8233990027
9	SIDDHANT S GORAL	EN/3rd YEAR	1402721105	siddhantsgoral@gmail.com	9015353128
10	MUNENDRA P. SINGH	EN/3rd YEAR	1402721051	munendra767@gmail.com	9758107323
11	PARITOSH MISHRA	EN/3rd YEAR	1402721061	parprime87@gmail.com	9643088798
12	SHUBHAM JAIN	EN/3rd YEAR	1402721101	shubham92j@gmail.com	7827064724
13	AKHIL KUMAR VERMA	EI/2nd YEAR	1502732003	vermaakhil0786@gmail.com	9560106749
14	SHIVANI SINGH	EN/2nd YEAR	1502721096	shivanisinghrbl1997.sb@gmail.com	-
15	AHMAD ALI	EC/2nd YEAR	1502731014	ahmad.ali78686@gmail.com	9506291559
16	ABHASH SRIVASTAVA	EC/2nd YEAR	1502731003	abhashsrivastava007@gmail.com	8743065261
17	SACHIN CHOUDHARY	EC/2nd YEAR	1502731128	sachin.choudhary58@gmail.com	8948716727
18	PRIYANSHU GUPTA	EC/2nd YEAR	1502731115	Priyanshug07@gmail.com	9069067287
19	RAJNISH KUMAR MISHRA	EN/2nd YEAR	1502721082	rkmishr15@gmail.com	7839223033
20	BHAWANA MISHRA	EC/2nd YEAR	1502731052	bntyagi71@gmail.com	-

APPENDIX- 2

Student Testimonials:

SHUBHAM CHOUDHARY

Team Leader EN 4th year

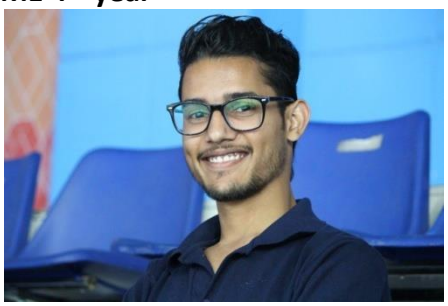
"Since during my school days I used to watch Robocon at Doordarshan every year and always fascinated by the machines, the task, the crowd cheering and all but never imagined that one day I will also be part of one such team.Robocon has taught me so many things in different ways. Driving a team for a common vision for 8 months evolves a leader inside you. Learnt why perfection is so important in real world scenario because 90 percent perfect machine will eventually score 0 point in the game field. Robocon is very similar to a small industry ,where you get a project (theme) , you Start brainstorming with your team from day 1 , make prototypes , fail , make prototypes again , get a design approved , make machine, practice drill repeat , practice drill repeat and launch your product to the end customers (match in the game field).

I can proudly say that most of my education is from outside academic classroom and is from Robocon's 3 years journey."

RAHUL GAUTAM
ELECTRONICS HEAD EC 4th year

"Having been associated to ABU ROBOCON for past three years has bloomed my engineering life in technical aspect. This years' ROBOCON has been the best of my entire participating year. ABU ROBOCON is not just an event but is a big platform provided to young enthusiastic and dedicated engineers to come up with creative ideas of achieving the target. It not an event that develops technical skills only but is a perfect blend of the skills required. At last I wasn't to conclude every upcoming young engineer who wants to enhance technical skill should participate in ROBOCON at least once in his engineering time."

SHARAD GUPTA
MECHANICAL DESIGN AND FABRICATION HEAD
ME 4th year



"Engineering is employing simple ideas to solve complex problems. As a Mechanical Design Engineer, I believe in first grabbing the most obvious model in hand and then stepping towards excellence with real-world simulations. This is what I learnt from my three year experience in Robocon. And this is what I teach to my juniors."

RISHABH KANNOJIA
PROCUREMENT HEAD **EN 4th year**

"Robocon for me begin as an experiment in mid-2014 and ended as a lifetime achievement in 2017. I was recruited in the team as I was the youngest NI Certified LabVIEW™ Developer present in the college at that time. But as it turns out I was more into managerial and accounting stuff, so I was asked to be in the procurement domain of the team where my job is to coordinate between different teams be it electrical, mechanical, programming and electronics and our faculty coordinator Mr. Gaurav Srivastava. I was responsible for carrying out a transparent communication between the team and our coordinator. Robocon 2015 themed "Robominton" by Indonesia was my ocean of learning as Robocon doesn't care from which domain or engineering background you belong, you only do what you are asked to. So, I worked for mechanical fabrication, sensor integration, motion control and of course, procurement. We did won a match there but were unable to qualify for the Super-League matches. That was my first LARGE SCALE victory.In Robocon 2016 themed "Chai-Yo: Clean Energy Recharging the World" by Thailand. It was yet another big experience because as we move towards the completion of our robot I was chosen to be the robot controller at the event as my role this time was only to deal with the management. It was quite an experience as when you are on the match arena, performance pressure, team pressure and everything builds up inside you and you are like '*Lord save me*'. Nothing happened this year as well but after we returned from Robocon 2016 I found myself at the position of leading a team of twenty members and that was tough. This year Robocon was themed "Asobi: The Landing Disc". We began our preparation as soon as the theme is out and planned to hit it big as it was our last time. At MIT did beyond our expectations and qualified to Super-League in the top 24 teams from 112 across India. That was the most proud moment for me as after three years of defeat we have seen victory. In

Super-League also we performed well but unable to qualify for the quarter finals but no one was to blame as it was a team job. Overall Robocon was a life experience for me and I wish my team all the best for years to come."

PRINCE AGARWAL
PROGRAMMING HEAD EC 4th year

"Robocon 2017 was a major turning point for Team Robocon AKGEC. I've learnt so many things in which most important is never to lose hope and always believe in team members. We ranked 17 among 112 teams and it was possible all because of team's efforts. Winnings matches against top teams of Robocon was a one big thing but to hear spectators consisting of COEP and VIER cheering for our team was a major achievement. Robocon not only helps you to gain knowledge but it also gives you motivation and courage to do things which a person can only think about. When it comes to me, Robocon helped me to grow exponentially and gave me exposure to different things. If there will be a chance for me to participate in robocon again, I'll do it without any second thought."

SANDESH SINGH
Mechanical Fabrication and Designing
EN 3rd year

"I do feel less important to state what technical learning Robocon'17 made to me. I just want to speak about two moments. At a time, the total weight of our bot came out to be 33 Kg, 6 Kg more than the maximum level of 27 Kg. Now the team worked on it as a drill. In just two days the team came out with a totally different bot. This time when the bot was placed on the weighing machine, the digital screen showed 27.33 Kg. Unexpected!! This was a moment. Second, it was when we played-out our second and last try to qualify for Super League series. We won but still don't know whether going to qualify or not. Not a victory moment but full of satisfaction. Even amidst the great-huge sound of the stadium, I could hear the voice of my heart. I came out of the stadium, walked-through the complete stadium complex. While there walking I saw a group of small kids playing. I got one

question in my mind; when these children would grow-up, would they be able to win International competition of Robocon; at that time would India be in a condition to win Robocon. This is the thing Robocon'17 gave to me."

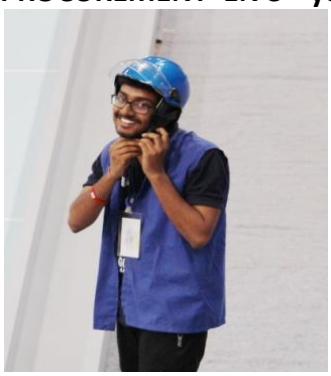
VAIBHAV SINGH

Mechanical Fabrication and Designing
ME 3rd year

"Excellence never emerges individually out of a person but rather requires a team. A group of person can never be called a team. A team is built out of responsibility and sacrifice; who other than Robocon can teach it better!"

SIDDHANT GORAL

PROCUREMENT EN 3rd year



"Whether Robocon be any competition or team for anyone to learn robotics but for me it is a journey where you have to invest your each and every moment to drive yourself insane to be better."

UJJWAL BARANWAL

Electronics ECE 3rd year

"Being a part of Robocon is one of the best thing that had happen in my life. It helped me to explore myself in many fields. It motivated me to develop team, built team spirit, and grow dedication to work for common goal for betterment of team. It helped me built myself."

MUNENDRA PRATAP SINGH

Electronics EN 3rd year

"Robocon was the best experience of my life. It gave me a deep knowledge of electronics and different mechanisms with many implementations. It teaches us how practical work varied from the academics. As it had taken us through different phases in its journey, I got to learn different life lessons. At last it is the best experiences of my life."

SHUBHAM JAIN

Multi-disciplinary EN3rdyear

"It was a great experience working in Robocon 2017 which provide me platform to work in domains which are not in my comfort zone like mechanical and procurement. Right from the beginning my role in the team was to suggest best loading mechanism that suits our bot and also making availability of various mechanical and electrical components on time. We develop a striker type of loading mechanism with the help of rack and pinion which was sufficient for upto 11-22 disc capacity. I was also involved in designing our gaming strategy for super league and league matches which were quite successful."

PARITOSH MISHRA

Programmer EN 3rd year

"Excellence in Robocon not just requires skill to handle technology but relies more on choosing technology and use it in an efficient manner keeping all the constraint in mind."

BHAWANA MISHRA
Electronics ECE 2nd year

"Being a member of team ROBOCON'2017 was a matter of great pride. It always puts a new challenge in front of us. I have learnt a lot from this, many things which I could never learn if I had not been a part. Besides enhancing my technical skills it taught me time management, team work and it has also increased my confidence level like never before. Going to the competition, meeting other teams was a great experience. Robocon not only provides us opportunity to give our best but also gives us a chance to know what other engineering minds could think. Being a part of team ROBOCON is one the best experience one can ever have."

SHIVANI SINGH
Electronics EN 2nd year

"ROBOCON'2017 is really a journey to be remembered. I had been recruited as a member of Robocon team in September'16. From that day I think the most learning experience of my life started. I got to know about the new technologies, components, mechanisms and various innovative skills. Alongwith this I learned hard work, team spirit, time management and most important the passion to achieve goal and saw effects of these qualities when we went to Pune for the competition. The event was so huge and inspiring, it was pleasure to see the bots of various teams. I learned a lot from the new technologies and components used in other bots. This year Robocon team of AKGEC ranked among the good teams of the competition and it boosted confidence and passion to achieve more and become best team. Overall Robocon groomed me in all fields and I feel pleasure to be part of this team and want to work more with it to become a part of best team of Robocon."

RAJNISH MISHRA

Mechanical fabrication and designing

EN 2nd year

"Participation in this activity is an end-to-end competitive yet fun experience from concept design for a system. We learned a lot and explored facilities in our college. Skills gained during Robocon prove to be useful at further walks of life. Our rankings have improved year after year and this thing has to be maintained. Overall it was fruitful event."

ABHASH SRIVASTAVA

Programmer ECE 2nd year

"I as a programmer in team and pit member for loading at main event participated in ROBOCON 2017 and can say that ROBOCON is the best robotics competition in terms of level, exposure, innovation and much more."

SACHIN CHOUDHARY

Programmer ECE 2nd year

"I am associated with ROBOCON team since 2016 and is really grateful towards what this team has contributed in building my technical skills. Every little opportunity is availed by me and thus is really a very special part of my college life. Assured guidance is provided which made projects like ROBOCON 2017 a huge success. The knowledge you get and the feeling of representing your college at national level is unexplainable. I also thank AKGEC-SKILLS for their immense support. I will continue to be a part of ROBOCON and will contribute towards its success in making better and better robots and projects."

PRIYANSHU GUPTA
Electronics EC 2nd year

"It was a great experience at ROBOCON event which deals with building up of robot on a defined theme. I had never thought that I could make such a task performing machine. It provided me a vast knowledge and practical working experience. It is an extremely enthusiastic field which gives a boost to learning and performance. It provided me an ability to think and take actions and helped in improving my technical skills, and still there is a lot to learn."

AKHIL VERMA
Mechanical Designing and Fabrication
EI 2nd year

"Team ROBOCON provides us a best platform to crave our ideas into robust machine. Being a Mechanical Designer I have learnt from Robocon 2017 is that you have to use other's invention to make your robot robust and 100% efficient, you can't start your journey from basic research and development stage. From my experience I want to share one thing that our main work is to convert our 80-90% working model into 100% working and robust machine because ROBOCON won't accept 80-90% working machine."

AHMAD ALI
Mechanical Fabrication and designing
EC 2nd year

"Having been a part of ABU ROBOCON 2017 has been an asset to my technical skills. I have been a part of the event ROBOCON this year, and it has pathway to my mind to accept any creative ideas. Like any other event Robocon is not merely an event to us but a journey. Keeping ourselves dedicated to one thing for such a long period, facing various adversities, be it non-working of model or failure of any idea but still being motivated for one goal is one of the biggest achievement that one can accomplish. As at last I must conclude that ROBOCON has always made engineers to be more creative and will always come up making the best mind to be the creative one."

APPENDIX- 3

Main Resource Vendors

S. No.	Department	Vendor Name	Address	Contact Number
1	Aluminium Component	AV Engineer	Plot No. 89, Sector 3, IMT Manesar, Gurgaon-122050	0124-4369023
2	Aluminium Component	Mittal Metalloys	92/10, Basant Balwant Market, Near Chaudhary More, G.T.Road, Ghaziabad	098993 57072
3	Electronics Component	Bonus Electronics	595-A, Lajpat Rai Market, Chandni Chowk, New Delhi	9958487858
4	Electronics Component	Everest Electronics	644-A, Lajpat Rai Market, Chandni Chowk, New Delhi	9871640314 / 23861760
5	Assembly like Ball Screw, Lead Screw	Sardar Mill Store	43, Shardhanand Marg, Swami Shradhanand Marg, Ajmeri Gate, New Delhi	9810002223
6	Assembly like Ball Screw, Lead Screw	Shivam Bearing and Machinery	38 - a Shradhanand Marg (G.B. Road), Delhi	42897275 / 9810481380
7	Aluminium Welding	Saifi Welding Shop	Saifi Argon Welding Shop, Ravidas Nagar, Patel Marg Ghaziabad	9891982143
8	Nut Bolt Vendor	Taneja and Jatin Hardware	A - 65, B.S. Road, Industrial Area, Ghaziabad	9818133613
9	Rack and Pinion	Everest Electronics	644-A, Lajpat Rai Market, Chandni Chowk, New Delhi	9871640314 / 23861760
10	Coupling Manufacturing	Sulaman Engineer Works	444, Saket Safe Compound, Mukand Nagar, Patel Marg, Ghaziabad	9311850334
11	Hardware Shop	Atul Mill and Hardware	Shop No. 201-204 , Main Road, Naya Ganj, Ghaziabad - 201001	9811341409 / 9899986493
12	All kind of Connectors	Gama Electronics	414-A, Lajpat Rai Market, Chandni Chowk, New Delhi	9811582005
13	Battries	rcbazaar.com	-	-
14	Electronics	robu.in	-	-
15	Wheels	robu.in	-	-


FIRE
EXIT
MATLAB and Simulink