



Annual Report

MISSION STATEMENT 2023

PERFORMANCE THROUGH STAGES

- STAGE ONE

98/100 Highest among all IITs, but concept was not applicable in real scenario due to lack of experience and money

- STAGE TWO

Incomplete implementation, worked out many issues however picking and shooting remained as core issues

- STAGE THREE

Make an optimal shooting using pneumatic, however picking mechanism was not robust and reliable.

2 matches againsts LDCoE, unable to attend practise matches as we arrived late.

PROBLEM STATEMENT

(summarise)

The ABU Asia-Pacific Robot Contest 2023, with the theme "Casting Flowers over Angkor Wat," challenges teams to design and operate rabbit and elephant robots that cooperate to toss rings into poles located in the Angkor Wat Area. The contest emphasizes safety, efficient robot performance, strategic cooperation, and adaptability to the venue conditions.

To succeed in the contest, teams should focus on designing and building efficient robots that can accurately pick up and toss rings. Additionally, strategic cooperation between the rabbit and elephant robots plays a crucial role, requiring teams to develop effective communication and coordination mechanisms.

The chief mechanisms we needed here were

- DRIVE
 - We used mecanum on RR and omni wheels on ER.
 - Mecanum wheels kept wearing off
 - Issue with driving both straight, use Gyro or Encoder based PID control, in the actual contest we calibrated all wheels manually, not precise but workable
 - We used commands from the App

- SHOOTING
 - Many mechanisms were tried out for shooting, a 90-degree, 120 degree and straight plane with rotating discs. Issue with grip, we used rubbers. Also learnt from other teams that badminton grips could be used.
 - However, we came up with an alternate, consistent shooting mechanism, we optimized actuators, used thin bore and long stroke cylinders with 75 psi pressure, lubricate with WD40 while ensuring no dust gets inside (install filters on the compressor. With this we were able to achieve shooting distances exceeding 4-5 meters at best.

- PICKING
 - Picking was the most difficult mechanism, At first we designed a pneumatic and servo setup to pick up rings with a claw type arm. Issue was unbalanced load on pneumatic actuator which could cause the rod to bend,

- Next, we installed 2 servos which did not provide sufficient torque
- Again, we reduced the moment and dimensions and made a smaller functioning picking mechanism, loading would be a little cumbersome. Since, it flipped the stack.
- Then we tried 2 stepper and screw rods setup to lift the stack, it worked but wasn't reliable we also attached supports to maintain the screw rod straight.
- Ultimately, the steppers were not optimized well.
- LOADING
- ALIGNMENT (OPTIONAL)

STAGE 3 (NATIONAL FINALS)

SHORTCOMINGS AND REFORMS

OBSERVATIONS FROM OTHER TEAMS

- They had plenty of sponsors
- Hired professional Mentors
- Brought plenty of students to the finals to work on the robots due to better finances
- Had much larger spending on the bots
- IITD Package is mandatory, constant ID Card checks were carried out.

ISSUES	FIXES	COMMENTS
Less budget	Approach more sponsors Update Sponsorship Brochure	
Screw Thread Mechanism unreliable	Prefer using V Roll+Extrusions+ Timing belt setup instead	Requires less rotations Also can be replaced with string mechanism

ESP 32 needed extra setup for servo and steppers, etc	Prefer MEGA+ESP32 setup, Mega for interfacing	
Issue with permissions while transporting bot	Get 2 permission letters from HOD, one for the Robot and other for the team	Confusion and extra procedures cost us time and risked our participation in the finals.
Only 6 members working on the bots in finals, not sufficient workforce	Arrange Logistics/finances to carry more members to the national finals	
Lack of mentor/professor with experience in Mechatronics	Approach professor of Mechatronics, Atul Sir for Guidance on various mechanisms	
Steppers were unreliable	Nema 17 did not provide sufficient Torque, Use of micro steppers were recommended by other teams	
Low Torque Output from Steppers	Learnt that Geared motors have higher torque output however they have less standing torque	
Wires often smoked up and produced too much heat	Using the header wires provides too much resistance, use single or multiple thick stranded copper wires	
Red connectors could be reverse connected resulting in negative polarity	Prefer batteries and connectors of yellow type	
Couldn't find grip in initial shooting mechanisms	Use Anti-Slip Badminton Grips	
ER steppers faced reliability issues	Prefer Micro step and Nema 23	Nema 17, not preferred for high torque applications
Appropriate Spares were not packed	Ensure that spares are packed, including extra microcontrollers, power banks and Extension Cords	

Mecanum Tyre rubber fell apart	Purchase replacement rollers, prefer omni first, do not use mecanum on rough surfaces
Lipo Batteries lasted short and swelled up	Always use balance mode for charging and use with battery testers
Arrived Late for Sessions	All 4 days are crucial, make sure to attend all days
1. Distribution of work	In the past, work distribution seemed to be completely random, with whoever happened to be present in the lab being assigned small tasks. Over time, it has become more organized, but I believe there is still room for improvement. For instance, if we have 2-3 projects to work on simultaneously, we could benefit from outlining and assigning specific responsibilities to each team member.
2. Money	While it may not be a major problem, I believe there is an opportunity to enhance our approach. I suggest designating one or two individuals to oversee sponsorship and related matters. This focused responsibility could streamline the process and yield better results.
3. Knowing more about project	To enhance the understanding of the project among both new and existing members, we can plan more frequent short meetups or group chats. These sessions will serve as opportunities to provide comprehensive explanations about the project's objectives and what we are currently developing. Additionally, conducting weekly progress meetings where we discuss the challenges we encounter will foster better communication and collaboration within the team.
People operating components with less knowledge and blowing them off	One need to have complete understanding of what he is dealing with. while one is learning about any component they can document what resources they have used and how did that helped them with resources links. this helps in handbook.

Having basic material to build anything at hand all the time	Need to get more sponsors asap. buy them all. Helps in fast prototyping. Waiting for part to come after the whole plan is ready is a waste of time.	
Batteries swelling	Having knowledge about usage, safety (swelling), and everyone needs to know everything about batteries.	
Having basic material to build anything at hand all the time	Need to get more sponsors asap. buy them all. Helps in fast prototyping. Waiting for part to come after the whole plan is ready is a waste of time.	Sabertooth Drivers do not have circuit protection
Batteries swelling	Having knowledge about usage, safety (swelling), and everyone needs to know everything about batteries.	

OVERVIEW

IIT Patna's Robocon team achieved this remarkable feat without the presence of a mentor or a substantial budget, distinguishing themselves from other teams. Despite the challenges posed by limited resources and lack of prior experience, their dedication, resourcefulness, and sheer determination propelled them to success. Their accomplishment demonstrates the team's exceptional skills, problem-solving abilities, and the spirit of innovation that thrives within IIT Patna. It is a testament to their unwavering commitment and passion for robotics, solidifying their position as an upcoming formidable force in the competition.