РОБОЦ ИНДИЯ - ПОВИШАВАЩА ИНОВАЦИЯ В УЧИЛИЩАТА

ROBOTZ INDIA – INCREASING INNOVATION IN SCHOOLS

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Abstract

The mission is to nurture a creative child through new technologies such as computing, sensors and artificial intelligence. School Children explored the wonderful science and computing through hands-on robots building and programming. We strive to develop the scientists and engineers of tomorrow with foundations of STEM learnt in a practice school methodology.

Keywords: Robots, Innovation, STEM, Schools, India

"What the teacher says in the classroom is not unimportant, but what the students think is a thousand times more important". - George Polya, a Great Mathematician

INTRODUCTION

Robotics seems to have caught on in the last year couple of years. Several schools have introduced Robotics as co-curricular activity through Robo Clubs. The World Robotic Olympiad (WRO) is attracting good participation from Indian schools.

Robotics technology is a pillar of 21st century innovation. It highlights the growing importance in a wide variety of application and emphasizes its ability to inspire technology education. Robotics is positioned to fuel a broad array of next-generation products and applications in fields as diverse as manufacturing, health-care, national defense and security, agriculture and transportation [1]. Robotics is not just about building robot. It is a medium to bring together knowledge in different fields to build a system. Learning Robotics is a process to gain expertise in multiple subjects, which are usually ignored while students decide to be fixed on a particular subject of interest [2].

Robots are helping to reveal a potential shift in kids' social and learning psychologies - moving from acts of knowledge transmission toward acts of exploration, collaboration, and creation.

There are several summer camps being organized in various schools across the country. The author served as the Technical Chairperson for the National Level Competition with the theme as Robotics for students in 6 – 12 Classes.

"Robotz India" National Level Competitions are aimed at harnessing the present day context of children relying on technology to foster their thinking on sensory and motor skills with expected learning outcomes in a very competitive ambience. These competitions result in the following attributes in the school children studying 6 – 12 Classes.

- Operational learning
- Extending knowledge and understanding the context of developing the robot
- Dispositions to learn
- Positioning technology in everyday life

During these competitions educators

- Recognize children's different preferences
- Develop awareness of the role of a wide range of technologies in the child's
- learning environment
- Acknowledge the range and diversity of children's early experiences induct children into culturally significant technological practices
- Extend their vision of the nature of children's technological competences beyond operational skills.

EXPOSURE

The Core Competencies expected are:

- Science, Technology, Engineering and Mathematics
- Mechanical, Electrical, Software, Time and Cost

The design process begins with formulation of a plan to build a Robot with a specified performance goal. Defining the Problem implies

- identifying the purpose of a construction
- identifying specific requirements

For Example:

A community wants to construct a robot zoo in which the "animals" move their heads, opentheir mouths and make appropriate sounds when they sense that someone is coming towardsthem. Design and build a prototype device which could satisfy this need.

A local pet shop wishes to sell a range of devices which automatically feed small cage pets (such as rabbits, gerbils, mice etc.) when their owners are away for the weekend. Design andbuild a prototype device which could satisfy this need.

The core skills expected of each team are:

- gathering information
- identifying specific details of the design which must be satisfied
- identifying possible and alternative design solutions
- planning and designing a appropriate structure which includes drawings
- building the Robot on the above lines

"Robot" building brings together native principles of Mechanical and Electrical domains. Thiscompetition looks for computational capabilities of a "Robot" based more on the Electrical and Electronics principles. In other words, the focus shifts to computational aspects of a Robot rather than the actual components such as motors and sensors that make it functional.

Robots @ School opens up the following opportunities [4], [5]:

- making academic pacing feel more personalized to each child with intelligent, interactive technologies that feel genuinely "human" in certain respects
- creating a more patient and accepting learning atmosphere by allowing technology with its limitless time and "superhuman" tenacity—to sometimes fill the role ofteacher
- leveraging kids' "relevance filter" to emphasize to them the importance of gaining certain kinds of knowledge, with the help of technology or without
- offering opportunities for kids to learn in ways that feel more like play - such as through proactive, exploratory, open-ended projects that involve Web technologies: activities which are increasingly valuable for developing internet-age competencies like sharing, remixing, and repurposing others' work

Today, many of our daily appliances and equipment use electronics, sensors and sophisticatedcomputer technologies. Robotics is a fun and engaging way to teach fundamental technology, maths and science concepts.

The increasing order of complexities feasible in the school students are:

- Robots in Motion: Simple Programming and Assembling
- Coming to Their Senses!: Sensors and Behavior
- Working it Out!: Incorporate problem solving and mathematics, adding variables such as distances and reaction timing
- Life of the Robots! Robots that interact with one another

Robots are attractive for youngsters and it is fun constructing them. While designing, constructing, programming and testing mobile autonomous robots, they experience that technology is fun, and they acquire knowledge in computing science, electrical engineering, mechanics and robotics. Teamwork and co-operation are cornerstones of any robotics project. Students will learn it is acceptable to make mistakes, especially if it leads them to better solutions. The robots constructed by the school children have been judged based on the following criteria [6],[7].

- Movement
- Manipulation

- Energy
- Intelligence
- Sensing
- Shape and form (design's aesthetic qualities, ergonomics, strength, stability, rigidity, and safety).

The high positives are:

- Attracting brilliant professionals to the Advisory and Technical Committees.
- Formation of Robotics and Artificial Intelligence Foundation [RAIF] – A Non-Profit Professional Organization. Recent expansion of the Executive Committee.
- Framing of a Curriculum for formal training in the areas of Robotics and Artificial Intelligence.
- Association with very reputed sister organizations.
- Student run Robot Clubs reaching out to the school children at nominal fee for training.
- Excellent lecture sessions by eminent experts were organized at no cost to the interested school students.
- A spirit of volunteerism stemming from idealistic goals.

Some of the Components used in the Learn – By – Doing Methodology put into practice in the “Robotz India Competitions” are seen in Figures 1, 2 and 3.

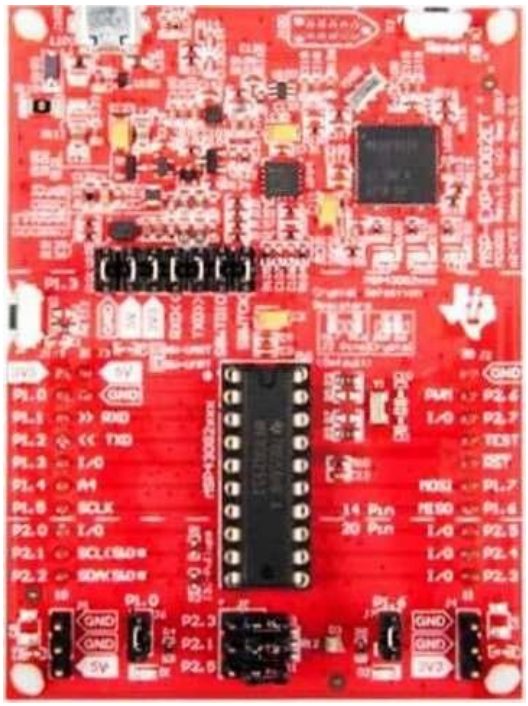

Fig. 1 *Texas Instruments MSP-EXP430G2ET*

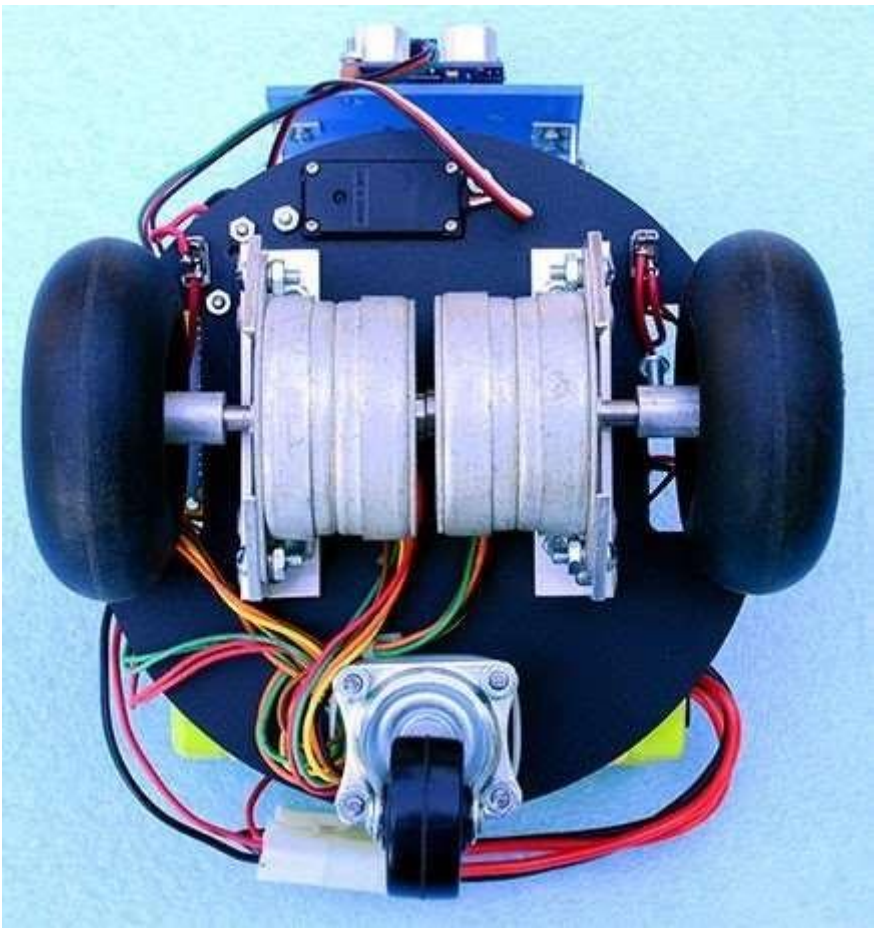

Fig. 2 *Stepper Motor*

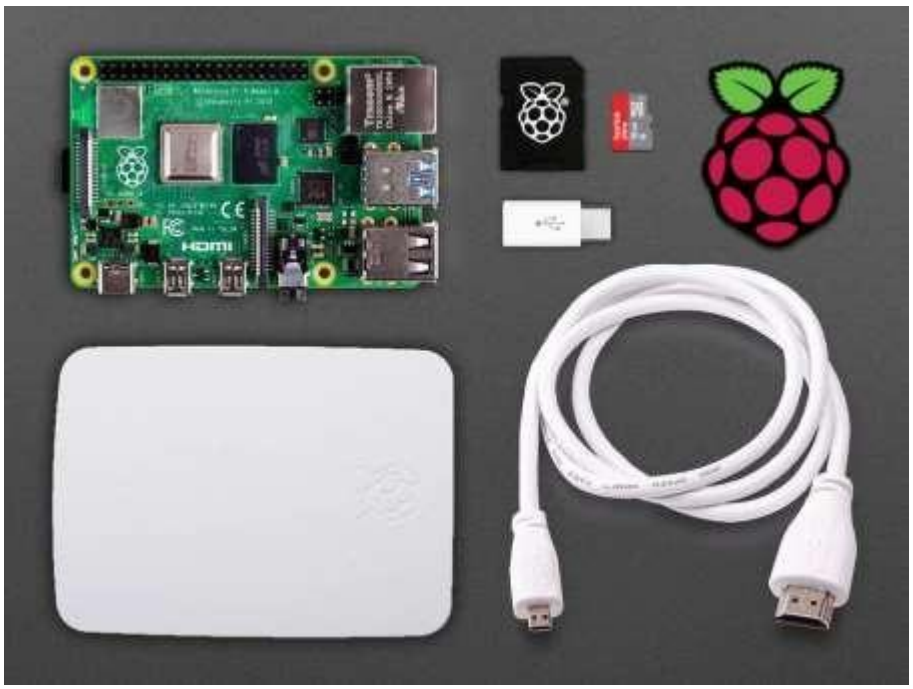

Fig. 3 *Raspberry Pi Basic Kit*

The cost was limited to a few hundred rupees per head in any given team. Most schools have provided financial assistance to the teams. A formal log book was maintained and the supervisor of the team was also duly acknowledged. The competitors were holding thebonafide certificate from the authorities of the respective schools. Please see figures 4, 5 and6 for pertinent snapshots.

Fig. 4 *Robotz India Competitions Launched on 28 June 2013*

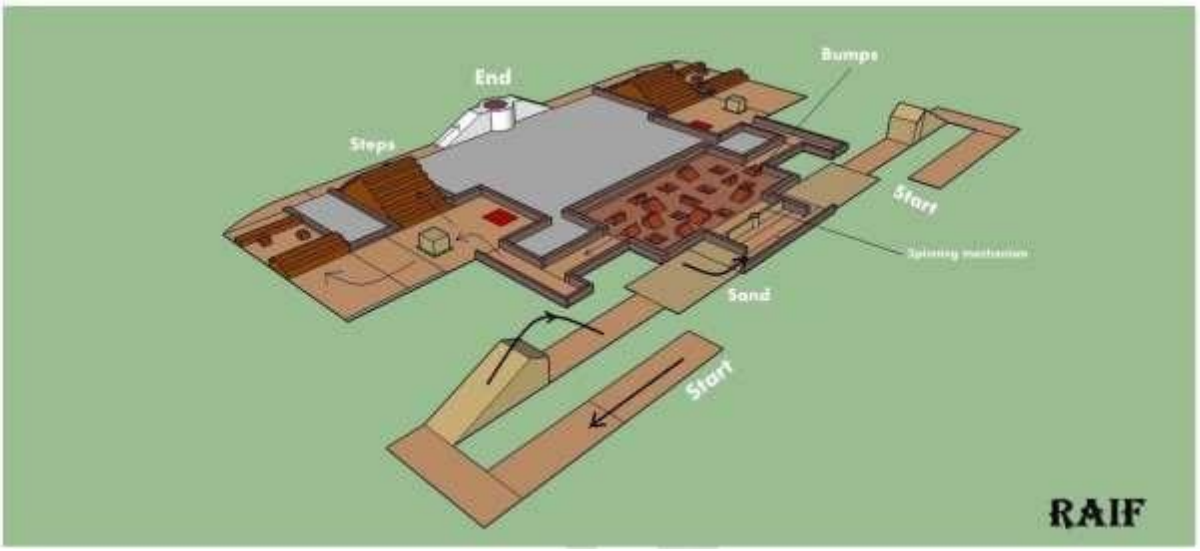

Fig. 5 *The Track for "Robotz India" Competitions*

Fig. 6 *The 2017 Winners*

CONCLUSION

40000 students, 500 educational institutions and schools from across India actively supported the "Robotz India Competitions". The author of this report served as the Technical Chairperson for the "Robotz India" brand of competitions for six consecutive years from 2013. We had a pan India team facilitated by Robotics and Artificial Intelligence Foundation [RAIF] and Anna University, Chennai. RAIF has taken the lead in organizing the competitions. The author places of record sincere thanks to (Late) Kris Kumar, Ms. Sukruti A Vadula and Ms. Prema Kodandan.

Robotics is an interdisciplinary field requiring knowledge of Engineering and Art. To build a robot one needs to have technical know-how of Electronics, Mechanics, Computer Science, Art and believe it or not, even Biology. The judges were very experienced domain experts.

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