ARYA College of Engineering & Information Technology
Approved by AICTE • Affiliated to University of Rajasthan, Jaipur
SP-42, Kukas Industrial Area (RIICO), Delhi Road, Kukas, Jaipur (Raj.) INDIA
Tel : +91-1426-247171,76-79 • Fax : 01426 - 247142

SBOT(Smart Surveillance Robot)

A

Project Synopsis

For

DRDO DIAMOND JUBLIEE : DRDO ROBOTICS UNARMED SYSTEMS EXPOSITION (DRUSE)

Submitted by:

1. **Rohan Mujoo**
   B. Tech. 1st Year (CS)
2. **Yash Chauhan**
   B. Tech 1st Year (CS)

DEPARTMENT OF COMPUTER SCIENCE

OCTOBER, 2018

PART A

SELF AWARE SPHERICAL SURVEILLANCE ROBOT

ABSTRACT

Self Aware Surveillance Robot is a robot which aims to improve the flat terrain (buildings/tactical operations etc.) surveillance facilities and ensure the safety of our soldiers. With this project we aim to create a robot that's capable of being aware of its surroundings, i.e. knows the difference between living and dead by employing the use of PIR (passive infrared) sensor. This feature would prove to be very helpful in reducing the causalities cause during operations. A camera module would be mounted inside the body of the robot to provide live feed/recording of the happenings in its surroundings. Other basic sensors like ultrasound sensors, accelerometer, GPS would also be used to guide the movement of our robot successfully through the given terrain. Using GPS module would allow us to map its location coordinates. The ultrasonic sensor would make it smart enough to map its own path. Another feature is that of a gas sensor which will keep it from going into poisonous area and making the soldiers aware about it as well.
This robot is intended to help the soldiers and army men in operations and act as the ultimate surveillance kit.

QUESTIONAIRE

1. **What is your motivation behind the project?**

   Having spent 11 years of my school lives in an army school, I've developed deep respect for defense forces. Thus, I feel this is my opportunity to come up with something so unique that can give back to the country. The robot I intend to build hasn't been made by our defense research yet and that's what I feel makes it special and motivates me to work on it.
   Also, this is a sentiment shared not only by me, but my team as whole.

2. **What are your specialized knowledge and expertise?**

   The members of my team and I, are proficient in programming and making robots. Being computer science undergraduate students, we've had the chance to be exposed to several programming languages. Though still in the learning phase, we have certain degree of command over robotics as whole and a deep interest in the subject as well.
   Some of our skills/field of knowledge are as follows:-

   => Embedded system
   => C# programming
   => Arduino

=> C Programming
=> Atmel boards

3. **Previous participation/awards/recognition**

Rohan Mujoo - Participation in CBSE exhibitions, Participation in IRIS, Winner in intel techfest, 2nd position in college techfest.

Yash Chauhan – Participation in AIRC, 2nd position in college techfest, RSLDC government skill certification.

4. **What are you planning to exhibit?**
   - Animation/Video.
   - Presentation through schematic diagrams.
   - Concept paper presentation.
   - Innovative ideas/concepts by means of graphical aid.
   - Mock presentation.

PART B

SELF AWARE SPHERICAL SURVEILLANCE ROBOT

TECHNICAL PROPOSAL

❖ Idea

Self Aware Surveillance Robot is a robot which aims to improve the flat terrain (buildings/tactical operations etc.) surveillance facilities and ensure the safety of our soldiers. With this project we aim to create a robot that's capable of being aware of its surroundings, i.e. knows the difference between living and dead by employing the use of PIR (passive infrared) sensor. This feature would prove to be very helpful in reducing the causalities cause during operations. A camera module would be mounted inside the body of the robot to provide live feed/recording of the happenings in its surroundings. Other basic sensors like ultrasound sensors, accelerometer, GPS would also be used to guide the movement of our robot successfully through the given terrain. Using GPS module would allow us to map its location coordinates. The ultrasonic sensor would make it smart enough to map its own path. Another feature is that of a gas sensor which will keep it from going into poisonous area and making the soldiers aware about it as well.
This robot is intended to help the soldiers and army men in operations and act as the ultimate surveillance kit.

❖ Concept

Self Aware Surveillance Robot is a spherical robot which will contain a camera and a PIR sensor which are being stabilized by a gyroscope parallel to the ground, so it can provide a stable and clear footage of its surroundings along with all the important details (like living or non-living things in surrounding, gasses in surrounding etc.) to the soldiers. Another feature provided by PIR is that, if the robot is in presence of humans it will freeze and lock itself in an attempt to look like a normal object camouflaging with the surrounding. The Ball itself isn't completely transparent and contains a transparent strip (one way mirror film) through which above mentioned devices can perform all the above mentioned tasks. Size of the robot would ideally be 20-30cm so the robot can go

unnoticed in its surroundings. (The size can be reduced if proper technical team works on it as we are only thinking of using premade market bought sensors).The robot will move with help of either, High torque DC motors or steppers. Servo motors will be used to work with the gyroscope and help stabilize the camera module and PIR sensor. Few finishing touches such as applying anti dust and moisture spray to keep the robot clean in all cases so that all the footage obtained is clear as well, making a small shaft/opening so as to employ future improvements and new sensors in the robots.

❖ Identified Theme And Solution(s)

The theme we have chosen is, "Soldier Assistance Vehicle". Our robot being a surveillance robot fits the theme perfectly as it can take the lead in all operations and help reduce the causalities among the soldiers drastically. With this project we aim tp bring a change. The robot has features such as ability to detect humans, self mapping, GPS tracking etc. which enables us to fulfill our needs and make our project a success.

❖ Salient Features

=>Return to home function – With this function we can command the robot to return to the base with a simple command. This is a very convenient feature and it reduces the effort required to steer the robot back to its base.

=>Anti Dust & Anti Moisture – With this function we make sure the robot stays clean so the quality of the footage from the camera being shot isn't compromised.

=>Ultra Sonic Radar Mapping – With this function the robot can map the area i.e. its surroundings to successfully steer itself with minimal human interaction. (We intend to include this step after we've successfully made a first prototype) (Refer Fig 1).

=>GPS tracking – A very simple feature that will help us track the position of the robot at all times.

=>Two in one – Being a spherical robot it can easily move around unnoticed and act as a spying robot as well while working as a surveillance robot.

❖ **Cost**

SNO	COMPONENT	AVAILBILTY	QTY	PRICE	TOTAL PRICE
1	CHASSIS	Unavailable	1	2000	2000
2	12v BATTERY	Available	2	550	1100
3	ATMEGA16 DEVELOPMENT BOARD	Available	1	500	500
4	HIGH TORQUE DC MOTOR	Available	2	1400	2800
5	STEPPER	Available	2	2000	4000
6	CAMERA MODULE	Available	1	1200	1200
7	HIGH TORQUE SERVO MOTOR	Available	4	950	3800
8	GAS SENSORS	Available	5	-	1250
9	GPS MODULE	Available	1	1150	1150
10	XBEE MODULE	Available	1	1400	1400
11	GYROSCOPIC SENSOR	Available	1	300	300
12	ACCELEROMETER	Available	1	300	300
13	PIR	Available	5	100	500
14	MISC		-	-	500
		TOTAL			**20800/-**
		UNCALCULATED EXPENDITURE			**5000/-**

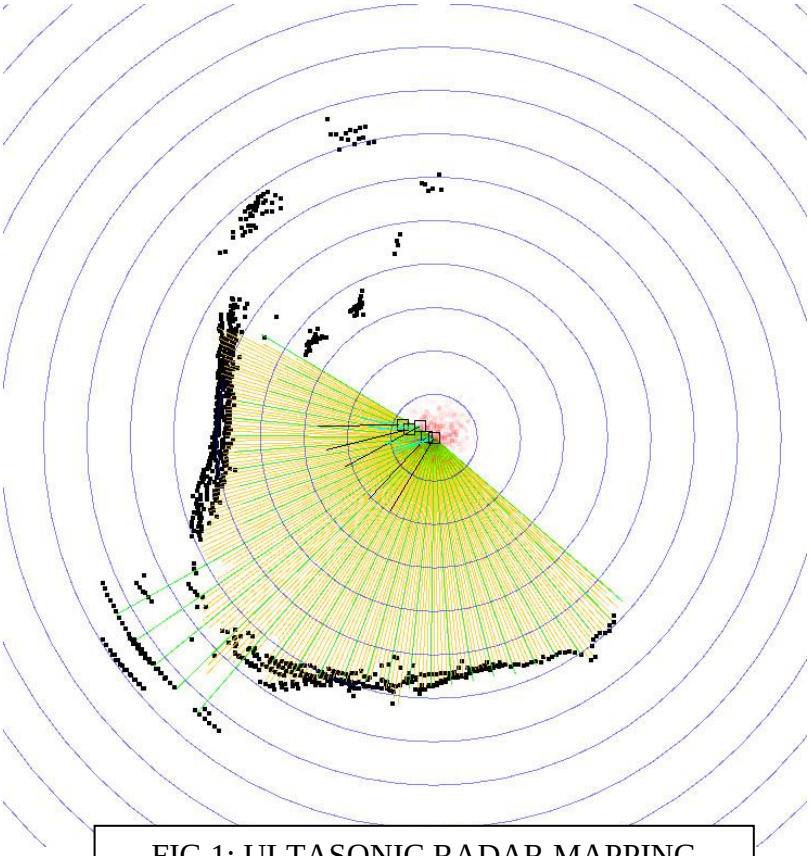

FIG 1: ULTASONIC RADAR MAPPING

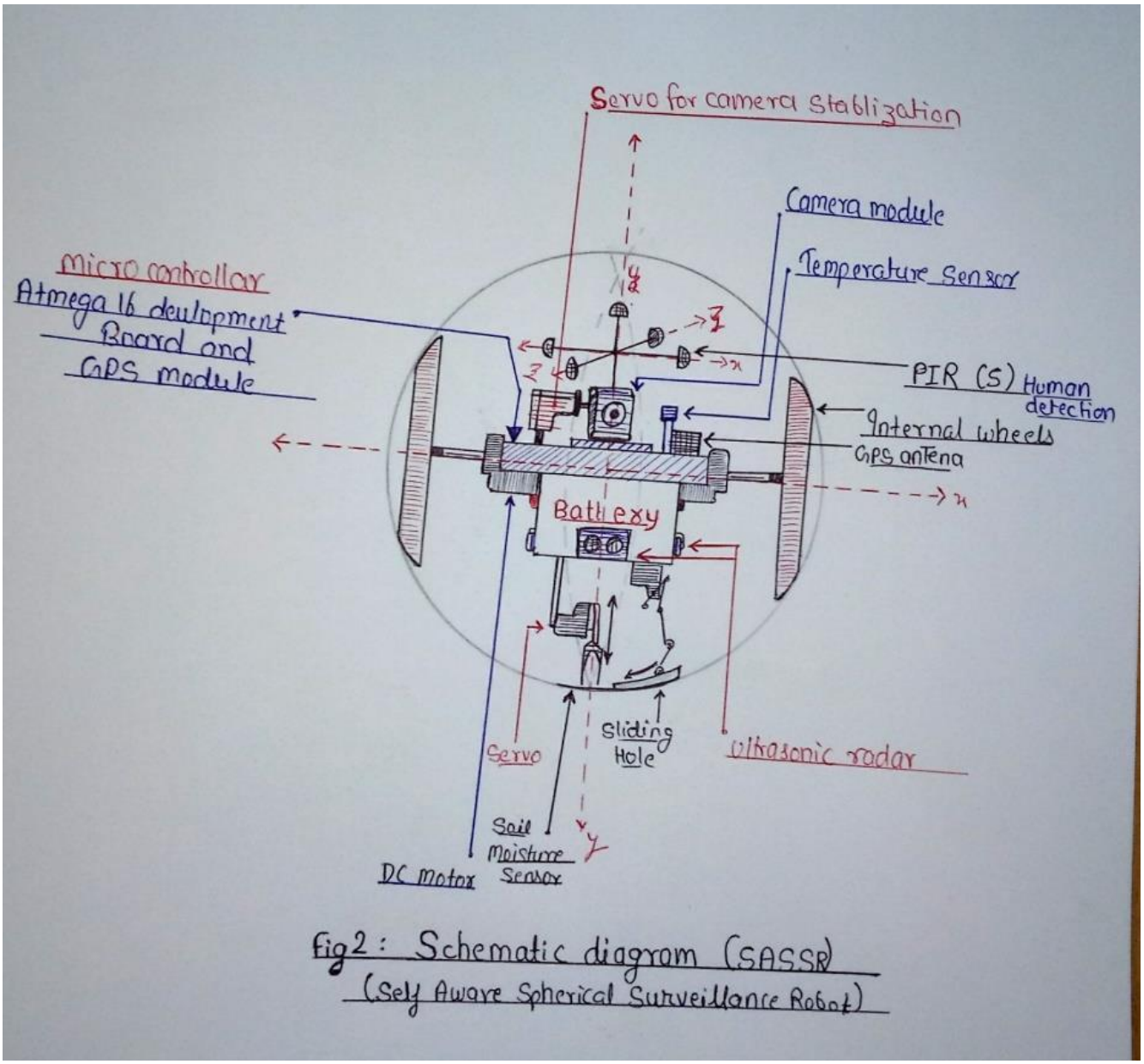

Fig 2 : Schematic diagram (SASSR)
(Self Aware Spherical Surveillance Robot)

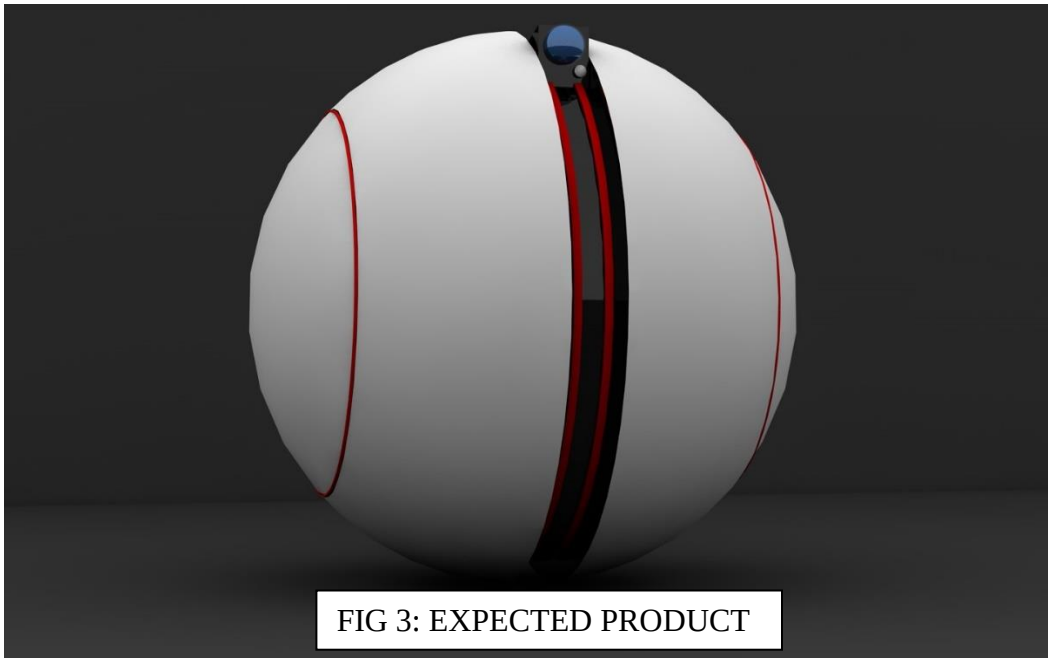

FIG 3: EXPECTED PRODUCT

If qualified for the second level of screening what idea/concept/solution you are proposing?
If, we manage to qualify for the second level, we intend to firstly, work on a prototype and take a step towards making our robot a realizable product. We would also introduce some new features to enhance its performance. We plan on adding several new sensors and mechanisms. The list of sensors includes. moisture sensor, temperature sensor (LM 35), new and better gas sensors(MQ-5,MQ-7) etc. And in case of mechanisms we plan on adding ways to increase the overall mobility of the robot thus enabling it to climb stairs and function on uneven terrain.