**Proposal for**

SUMMER UNDERGRADUATE RESEARCH AWARD (SURA) – 2018

Design and Fabrication of

Semiautonomous Robot as a Research Platform



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**INTRODUCTION**

Many people in poorer societies suffer because of non-availability of simple and standard technologies to the people at the grassroots level. Delivery of healthcare to the rural population is an area of concern. There is a marked difference in the healthcare scenario between the rural/remote areas and urban areas. It is observed that compared to urban areas, in rural areas, doctor to population ratio is lower by six times, hospital beds to population ratio is lower by 15 times and per capita public expenditure on health is seven times lower. A large number of health facilities have been set up by the government but still, the numbers are not sufficient to serve the entire rural population. Many existing facilities lack resources and/or trained medical professionals, which results in non-availability of quality healthcare to the rural population. Villagers end up travelling large distances to towns or cities to get medical services.

In a study done by Indian Space Research Organisation (ISRO) on the utilisation of the Primary Health Centres (PHCs), 47 percent of the population depends on the government PHC for their healthcare needs. Also, the same study points out that 14 percent of the patients travel 9-15 Km, 31 percent travel 35-45 Km and a huge 55 percent travel more than 55 Km for accessing secondary or tertiary services. It results in extra expenditure on travel and loss of pay for the patient as well the person accompanying the patient.

Thus the device that we intend to create can give a basic overview of patient’s health by measuring parameters like ECG, Non-invasive Blood Pressure, Glucose level, Temperature, Oxygen Saturation levels, Heart rate, Pulse Rate and other required information showing the dangers to health and how they can be treated primarily. It can maintain health records and compare them periodically for health comparison.

**OBJECTIVE**

1. To create an integrated basic body health check-up and health card generating machine.
2. To understand the working of relevant medical equipment and to implement them directly or in a modified way in our design.
3. To bring down the cost of basic health check-up by-
   1. Using the working principles of certain health check-up machine parts to design a cheaper alternative of our own
   2. To adjust the accuracy factor in a way so as to optimize the cost
4. Developing a final health report/ health card (electronic and physical) on the basis of basic medical assessment.
5. Providing a brief analysis of the report as well as some basic health tips to the user.
6. Provisionally planning to integrate/ make heart rate, pulse rate, Sp02, height, weight, blood glucose, blood cholesterol, blood group and other basic measurements.

**APPROACH**

Mechanical-

The initial part of the project will be designing mechanical body of the system with the help of CAD modelling software. Next part includes inculcating various devices or systems needed. If possible we will try to create our own devices according to needs or will use existing devices to measure.

Electrical-

Next section includes selection of various devices to measure required parameters. For including these devices we will create mechanisms like extending arm and all, control them via circuitry including pneumatics and microcontrollers.

We will be focusing on mainly five tasks:

## Idea screening

Initially we will be exploring existing devices and systems, and then keeping in mind their pros and cons and prices as well as integrability will come up with new customized/ self-designed devices and systems.

## Concept development

## Proof of concept

Before proceeding to the manufacturing phase we would be going through the proof of concept phase which would involve testing the circuit, testing the devices and their accuracy, testing the mechanisms created for automation. We would also test their reliability and

## Designing and Manufacturing

Next we will be concentrating on the final layout of the system with all devices and mechanisms integrated such that is easy to operate by a lay man and give detailed printed health card as well store them in e-form systematically. After this we will begin the manufacturing of our first prototype.

## Testing and Improvements

After completing manufacturing we will start thorough testing of the prototype.

We would try to install the device in a health care centre for a day or two and take numerous measurements and see if the results are correct and consistent.

We would also take advice from doctors and technical persons to make the device better and more user-friendly.

For further improvement we would try to make devices more reliable and accurate.

**APPLICATION**

1. Urban people have an easy access to certain basic health monitoring machines. But people in the remote-areas do not have sufficient health check-up facilities and availability of doctors. They also can’t afford to go to private practitioners. This problem can be solved by our device that will be aimed at minimizing cost, maximizing efficiency of check-up and can solve issue of limited availability of doctors.
2. Development of a physical as well as electronic health card. A database can be created for analysing the health of a group of people as well as keeping track of patient’s health over a duration.
3. Further advancement can be made in our model in terms of incorporation of sophisticated devices/systems, hence increasing the accuracy of results. This machine can be used as a preliminary check-up device. This would help in the automation of the procedure thus reducing the requirement of man power, human errors and related problems that are frequently encountered.

**ESTIMATED BUDGET**

| S. No. | component | Estimated cost (INR) |
| --- | --- | --- |
| 1. | X Channel |  |
| 2. | Arduino | 500 |
| 3. | Pulse+spo2 | 1200 |
| 4. | Respiratory exerciser | 300 |
| 5. | Blood pressure | 1500 |
| 6. | Blood glucose+ cholesterol +hemoglobin | 2000 |
| 7. | Eyes test lens | 4000 |
| 8. | Weighing machine | 1000 |
| 9. | Height | 200 |
| 10. | Piston+Sensors+wires | 5000 |
| 11. | Miscellaneous |  |
|  | Total | 25000 |

**FACILITIES REQUIRED**

1. We will be requiring 3D printing and circuit designing facilities like PCB printing, soldering etc.
2. Laser cutting and hex channel cutting facilities.
3. Bio-medics instruments and devices.
4. Acrylic sheet and its cutting.
5. Continuous interaction with a doctor and technical person.