



Embedded

Obstacle detection and 180 degree map building with a rotating Ultrasonic range sensor.

Problem Statement: Make an ultrasound echo based 180 degree rotating ranging device which scans an area and transmit signal wirelessly, to a handheld module which displays the results. The device should be capable of performing following two basic tasks.

Task 1: Plot a 2D map of an arena, which will have cubical obstacles placed at different positions upto a radial distance of 1 meter from the sensor position.

Task 2: Calculate the displacement of an obstacle.

Explanation:

Task 1

- The ultrasonic sensor mounted on a servo motor will sweep 180° angle.
- Distances of Obstacles are detected at different angles of the servo.
- This data is sent wirelessly to the other module.
- With known angle of servo and distance of obstacle at that angle a 2d Map in polar coordinate system can be plotted.
- This map is to be plotted on a GLCD (with proper scaling) so that it can be intuitively perceived.

One can alternatively display results on a computer screen (using visual design languages like Processing etc) via UART communication between the microcontroller and computer.

- ❖ One can also use 2 or more sweeps and take rolling average of values for better result.

Task 2

- After completion of task 1, teams will proceed to task 2, where there will be only one obstacle on the arena.



- After one scan, the system will detect the position of the obstacle and wait for 30sec.
- During this time the obstacle will be moved to a new position.
- The system will again scan through the arena and detect the new position of the obstacle.
- Using the original and current positions of the obstacle, the displacement of the obstacle is to be calculated.

Specifications:

- There are no physical restrictions on the size of circuit of the hand held module, but the module which will be kept on the arena should not have any dimension more than 15cm.
- The mounting height of ultrasonic sensor should not be more than 15 cm from the base
- Obstacles will be cubical in shape and different obstacles will have different side lengths, minimum being 8cm.
- The ranging device is to be kept at a predefined location on the arena and measure distances with respect to this position.

General Rules:

- Only basic ICs (4xxx and 7xxx) and 8-bit microcontrollers (or any other development board based on this) are allowed. Use of any other IC should be intimated to us and verified.
- The participants may solder on any general purpose PCB. Assembly on printed circuit boards can also be done, only if these have been specially fabricated by the participants. Boards from readymade kits should not be used. Participants using printed boards should bring along photo plots as a proof of originality.
- Please note that the judging criterion favours a proper layout of the components along with a robust circuit.
- The software written should be original and not copied from any other source



- The participating team must necessarily register themselves on the event website.
- Abstract submission should be done by the Team leader from the id he has registered on Techkriti's website.
- Failure to implement the above requirements would make your design ineligible for the competition.
- The teams must be able to provide the working proof (photo, video, code sample) if and when asked before their participation is confirmed for the final event.
- The organizers reserve the rights to change any or all of the above rules as they deem fit. Change in rules, if any will be highlighted on the website and notified to the registered participants.
- The teams must adhere to the spirit of healthy competition. The teams must not damage their fellow participants' circuit in any way. Judges reserve the right to disqualify any team indulged in misbehaviour.
- Judges decision shall be final and binding on all.

Judging Criteria:

- Judging would be subjective.
- All basic compulsory features should be implemented and only after their evaluation would the extra features would be considered and assessed.
- The effectiveness of the hardware and software used in solving the problem statement.
- User interface of the device.
- Robustness and innovation in design of the device.
- Cost effectiveness of the device.
- Extra features implemented, may add much to your score. They should complement the original design.
- Presentation (either a PowerPoint presentation or a neat block diagram can be used).
- Points Break-Up would be informed at the time of call for abstracts.
- Judges would be faculty of Department of Electrical Engineering, IIT Kanpur.

**Abstract:**

Once registered, in order to qualify for the event all the participants need to submit a PDF documents of the abstract in the mentioned format.

- The abstract format can be downloaded from the website.
- All the abstracts must be sent at ecdc@techkriti.org.
- Only one abstract submission is allowed. In case more than one abstract is received from a team, the latest submission will be considered.
- Last date of abstract submission will be informed later.
- If you have not been able to submit the abstract by the deadline, contact the managers

