Progress Presentation-I

e-Yantra Summer Intership-2017
Modular Robots

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Overview of Project

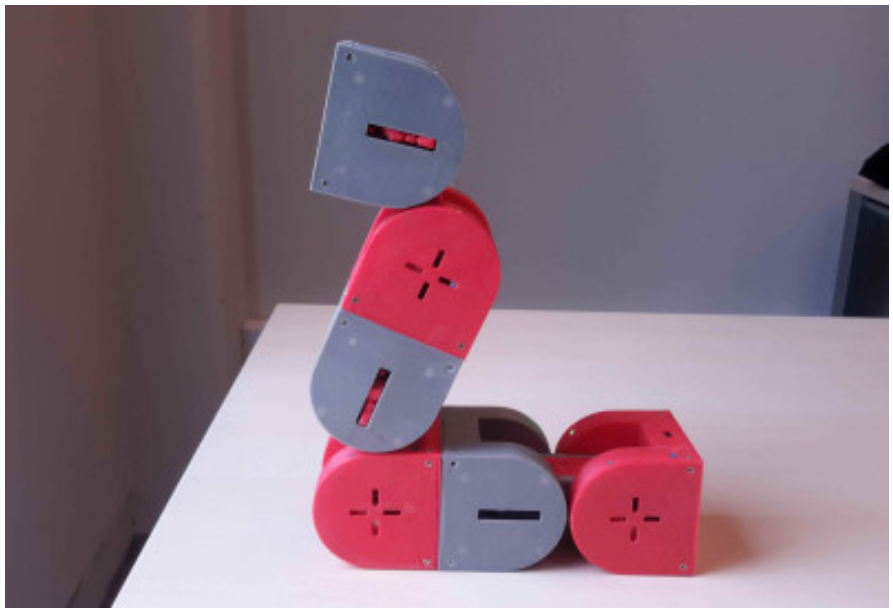
- **Project Name**: Modular Robots
- **Objective**
  1. To build a Self-reconfigurable autonomous robot which can deliberately change shape by reorganizing connectivity between the modules.
  2. To add sensors to the robot and make it smart.
     (To sense and take action according to the environment)
- **Deliverables**
  1. A stable modular robot which is able to change its shape upon the need of the environment.
  2. Code and Documentation of each Task.

Overview of Task

Task No.	Task	Deadline
1	Getting Familiar with existing models of Modular Robots	2 days
2	Interfacing Arduino IDE with Servo, Bluetooth and Sensor	3 days
3	Testing and selecting appropriate sensors to be added in the module	2 days
4	Make design changes in the modules for accommodating sensors.	4 days
5	Assembling all the selected parts. Four robotic modules need to be produced	4 days
6	Applying algorithm to check different types of motion (Wheel, Snake, Ladder)	7 days
7	Autonomous Obstacle Avoidance using sensor detection and self-reconfiguration	6 days
8	Code & Documentation	6 days

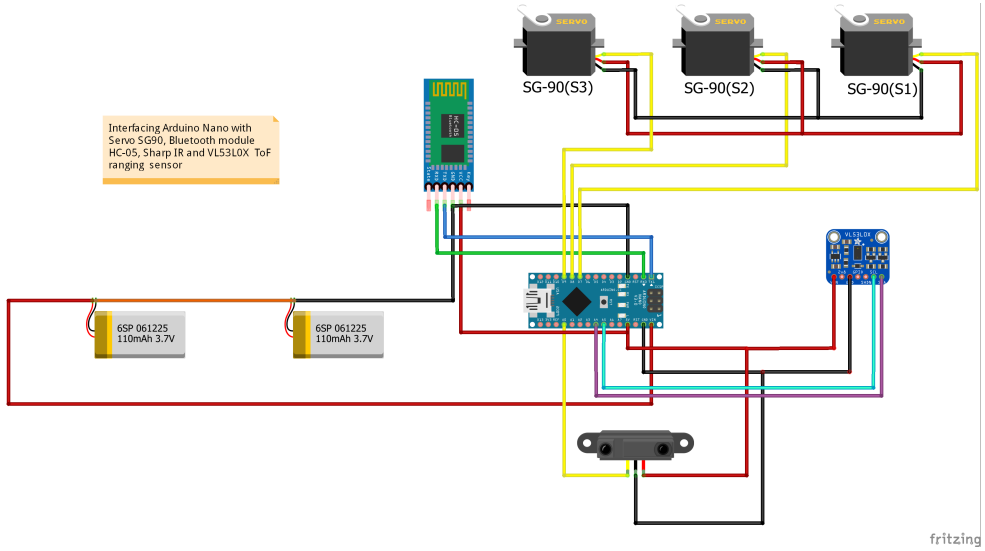
Tasks Accomplised

- **Task-1: Getting familiar with existing Modular Robots.**
  - Collected information on existing modular robots.
  - Prepared a report and concluded that the Dtto Modular Robot is the most promising option under the given time and resources.



Tasks Accomplised

- **Task-2 + 3: Selecting and interfacing sensors, servo motor and Bluetooth module with an Arduino.**
  - Successfully interfaced Bluetooth module HC-05 to HC-05 and HC-05 to PC/Android communication.
  - Interfaced servo motors and tested the Sharp IR sensor and VL53L0X ToF sensor for obstacle detection/distance measurement.

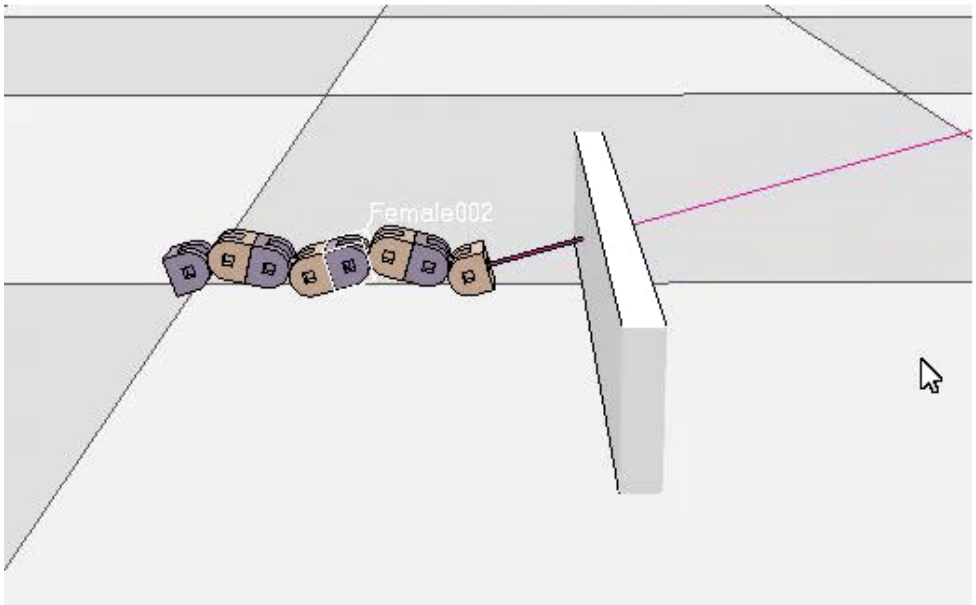


Tasks Accomplised

- **Task-4: Making design changes in the modules.**
  - No major design changes were required as the modules have space for the tiny VL53L0X distance measurement sensor.
  - Holes for the screws had to be expanded due to unavailability of M1.7x4mm screws.

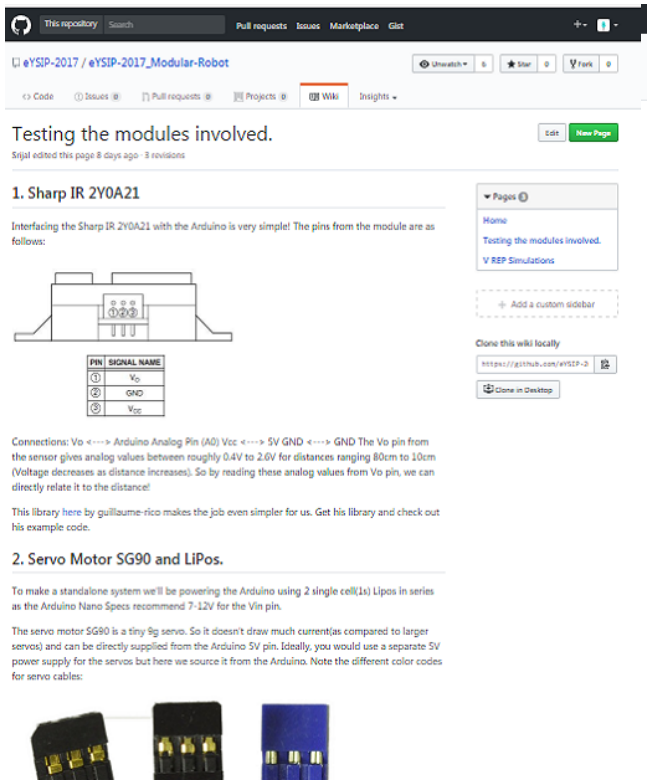
Tasks Accomplised

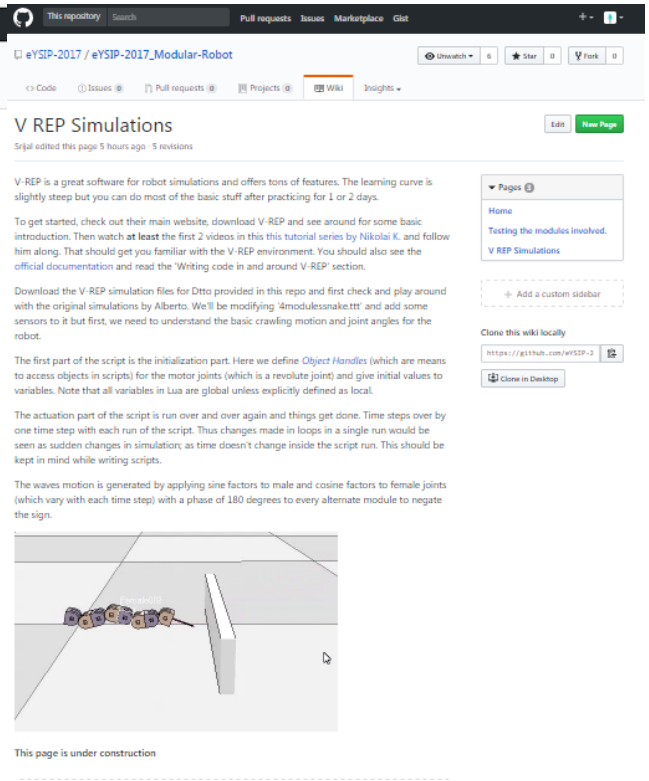
- **Simulations in V-REP**
  - Got familiar with the V-REP environment with Lua scripting and implemented practice simulations.
  - Understood existing Dtto movements and modified design to add proximity sensor which can detect obstacles and also measure its height.
  - Crossed the detected obstacles by reshaping modules in V-REP. See video.



Tasks Accomplised

- **Code and Documentation**
  - Uploaded well-commented code (Arduino + Simulations) on GitHub for every stage.
  - Maintaining a detailed documentation of every step we take on GitHub Wiki of our repository.





Challenges Faced

- Appropriate screws (M1.7x4mm Flathead) were unavailable, so the CAD design was modified multiple times and the printing and assembling of modules has been delayed.
- The specified Servo motor, MG92B is unavailable in local and online stores so we're forced to use a lower torque motor MG90S, which is the closest that can be fit under the given module dimensions.

Future Plans

- All printed parts assembled. Four Robotic modules to be assembled.
- Develop effective and generalized algorithms for different motions.
- Obstacle detection using sensors and decision making to avoid/overcome the obstacle while robot moves from one point to another.

Thank You

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