# ARDOP 3.0
A Humanoid Robot

I. INTRODUCTION

ARDOP is an acronym for Autonomous Robot Development Open Source Platform, after the success of the first two generation we would like to take this forward to the third generation. This is an interdisciplinary project which lays foundation for continuous research in the field of Robotics, Computer Vision, Kinematics and Motion Planning and Machine Learning.

ARDOP 3.0 consist of a four wheel mobile base capable of localizing and navigating within at total work area of 1000 sq-ft or more, a compartment is placed on top of the chassis to house the batteries and controllers. The upper body composed of two 6DOF two arms to perform pick and place operation, a 2DOF neck. A Kinect and Amazon echo dot is placed inside the head.
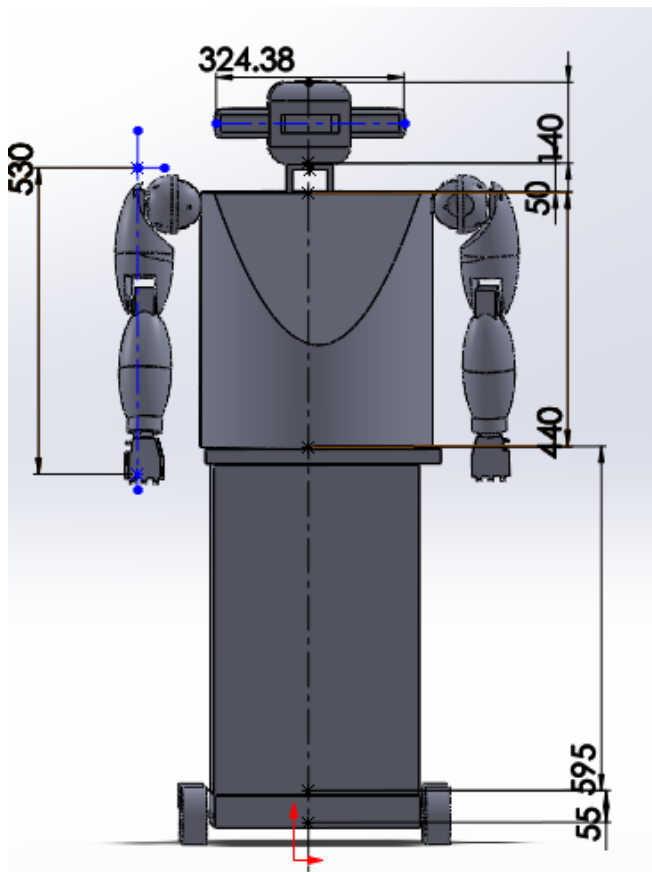

II. OBJECTIVES

The robot will start from the starting point (O) to source zone (A) which will be the source location. There will be several objects kept in the source zone. The robot will be trained top recognized these objects. We will instruct the robot to pick up one of these objects (marked in red). Once picked, the robot should navigate to the Destination Zone (B), which will be across the room, and place the place the object in the Destination (marked in green). ARDOP 3.0 is a fully mobile robot which would be completely developed on ROS. Deep Learning models is used for object recognition and classification using TensorFlow. Use of forward and inverse kinematics in ROS Moveit! for the pick and place operation. Implement SLAM for the localization, mapping and path planning.
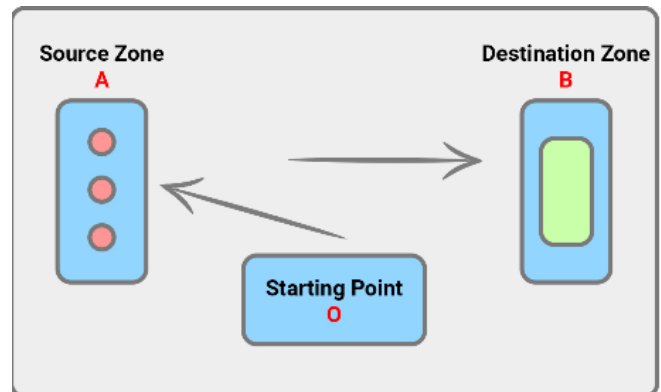
III. IMPLEMENTATION
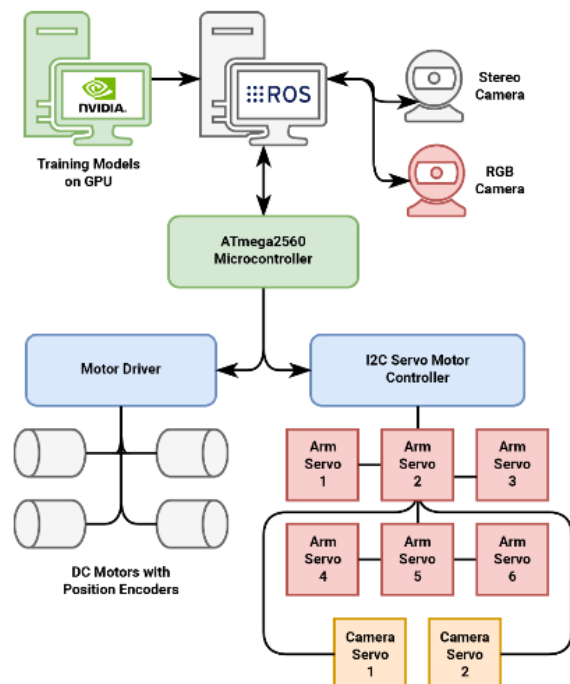
IV. BUDGET

* Purchase will be done over online or from OEMs(Original Equipment Manufacturer)

No.	Description	Qty	Unit price	Aprox. Price (INR)
1.	MG958 Servo Motors (x10)	25	2000	50000*
2.	NVIDIA GPU's	2	50000	100000*
3.	Servos for Camera Mount	5	1000	5000
5.	Arduino Mega 2560	2	3000	6000
6.	Fasteners and Clamps	200	10	2000
7.	Support for Body (Metal Stand)	1		5000
8.	I2C Servo Motor Driver	2	1000	2000
9.	High Torque DC Motors	10	2000	20000*
10.	Slot Position Encoders	10	100	1000
11.	Acrylic Board (Chassis)	2	1000	2000
12.	Camera and Vision systems	2	15000	30000*
13.	RGB Webcam	2	1500	3000
14.	Amazon eco dot	2	10000	20000*
15.	Battery system	3	10000	30000*
16.	Miscellaneous Components + Wires			20000
Total Estimated Cost				**296000**

Most of the cost involved is with the motors and NVIDIA GPU's , they can be used by many projects apart from this project. The project will be one of the flagship project of Propel Lab-1 ,and we plan to continue this project for a span of five years. All equipment/components purchased will be a part of Robotics and Embedded Systems lab and would be used for the continuation of this project.

V. SCOPE OF PROJECT:

- Publishing a research paper at an international conference/Journals like,
  - ICRA –IEEE International Conference on Robotics and Automation.
  - CASE - IEEE International Conference on Automation Science and Engineering.
  - IROS – IEEE/RSJ International Conference on Intelligent Robots and Systems.

- Machine learning being the frontier area of research in the present contest will help our faculties and students to be updated with the latest work
- Over time this project will get matured and on par with global universities like CMU and UPEN. It will equip our students for global education.
- Students passion towards the technology and engineering is encouraged with the proper ecosystem. This will defiantly help them to continue their higher education.
- Many global contest will be organized around such a project and One such competition is "Amazon Picking Challenge". We can participate in this with 2 year preparation.
- This is project needs understanding and contribution from multiple disciplines of engineering Electronics, Mechanical and Computer/information science. This will bring the coherence and inquisitiveness in research and product development