A seminar on Pick & Place Robot

Presented By-
VINOD KUMAR
31804106

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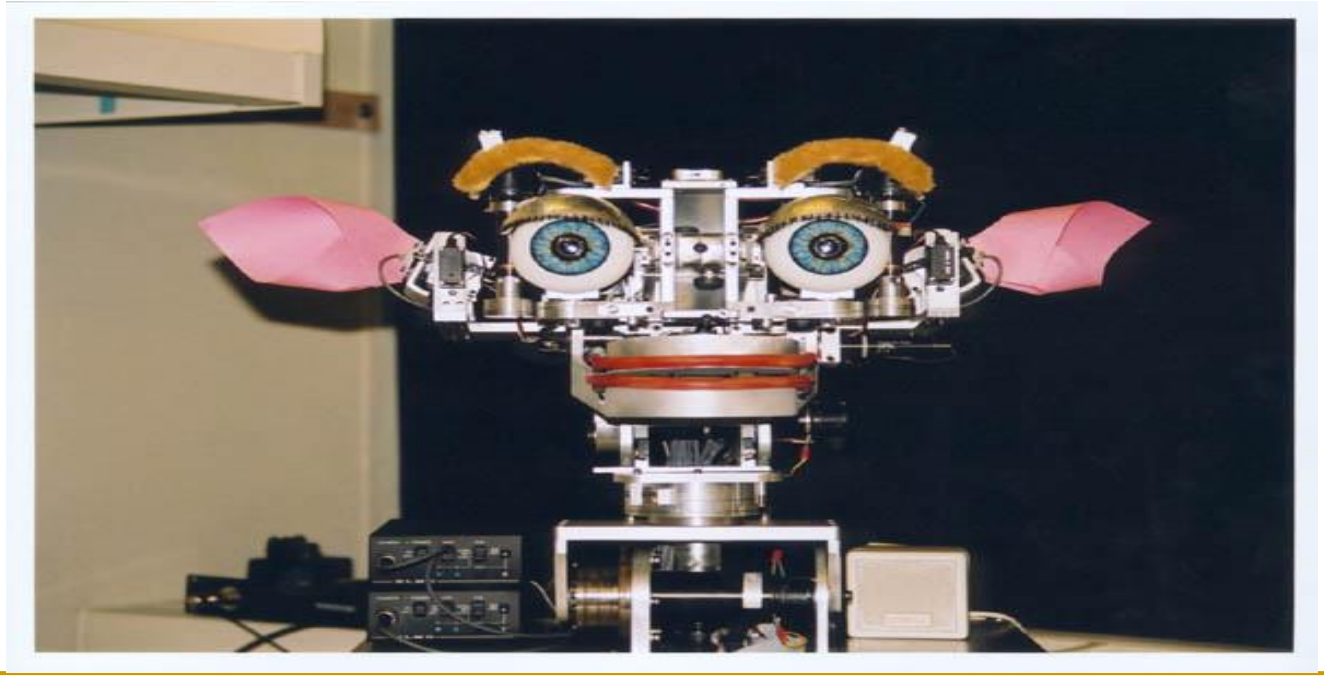
Definition:-

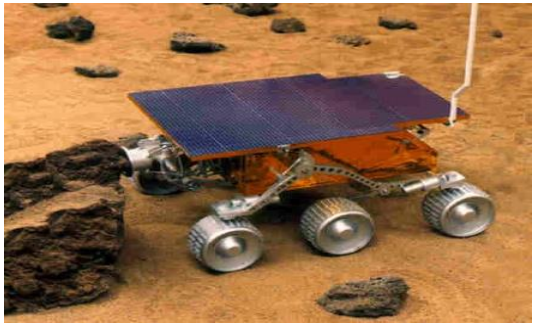
"A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks." (Robot Institute of America)



Ideal Tasks

Tasks which are:-

- **Dangerous**
  - Space exploration
  - chemical spill cleanup
  - disarming bombs
  - disaster cleanup
- **Boring and/or repetitive**
  - Welding car frames
  - part pick and place
  - manufacturing parts
- **High precision or high speed**
  - Electronics testing
  - Surgery
  - precision machining



Control

- Open loop, i.e., no feedback, deterministic.

- Closed loop, i.e., feedback, maybe a sense of touch and/or vision.

Types of robots

- **Pick and place**
  - Moves items between points

A SCARA robot (Selective Compliant Articulated Robot Arm): A pick-and-place robot with angular x-y-z positioning

- **Continuous path control**
  - Moves along a programmable path

A six-axis industrial robot, but an additional amount is often spent for tooling and programming.

- **Sensory**
  - Employs sensors for feedback

Pick and Place

- Moves items from one point to another
- Does not need to follow a specific path between points
- Uses include loading and unloading machines, placing components on circuit boards, and moving parts off conveyor belts.

A Cartesian robot for picking and placing circuits on circuit-boards

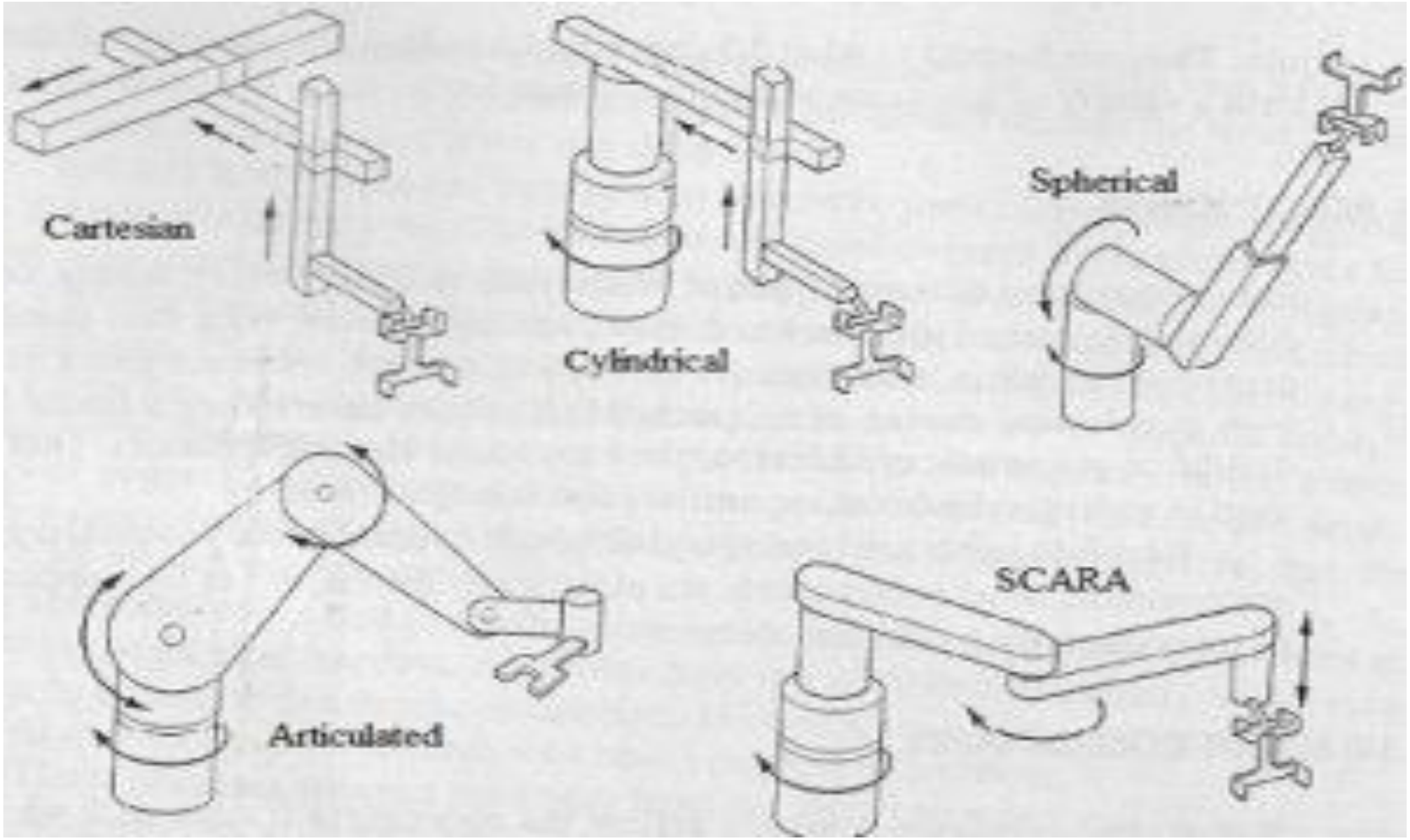
Robotics Terminology

- Link: A rigid piece of material connecting joints in robot.
- Joint: The device which allow relative motion between two adjoining link of robot.

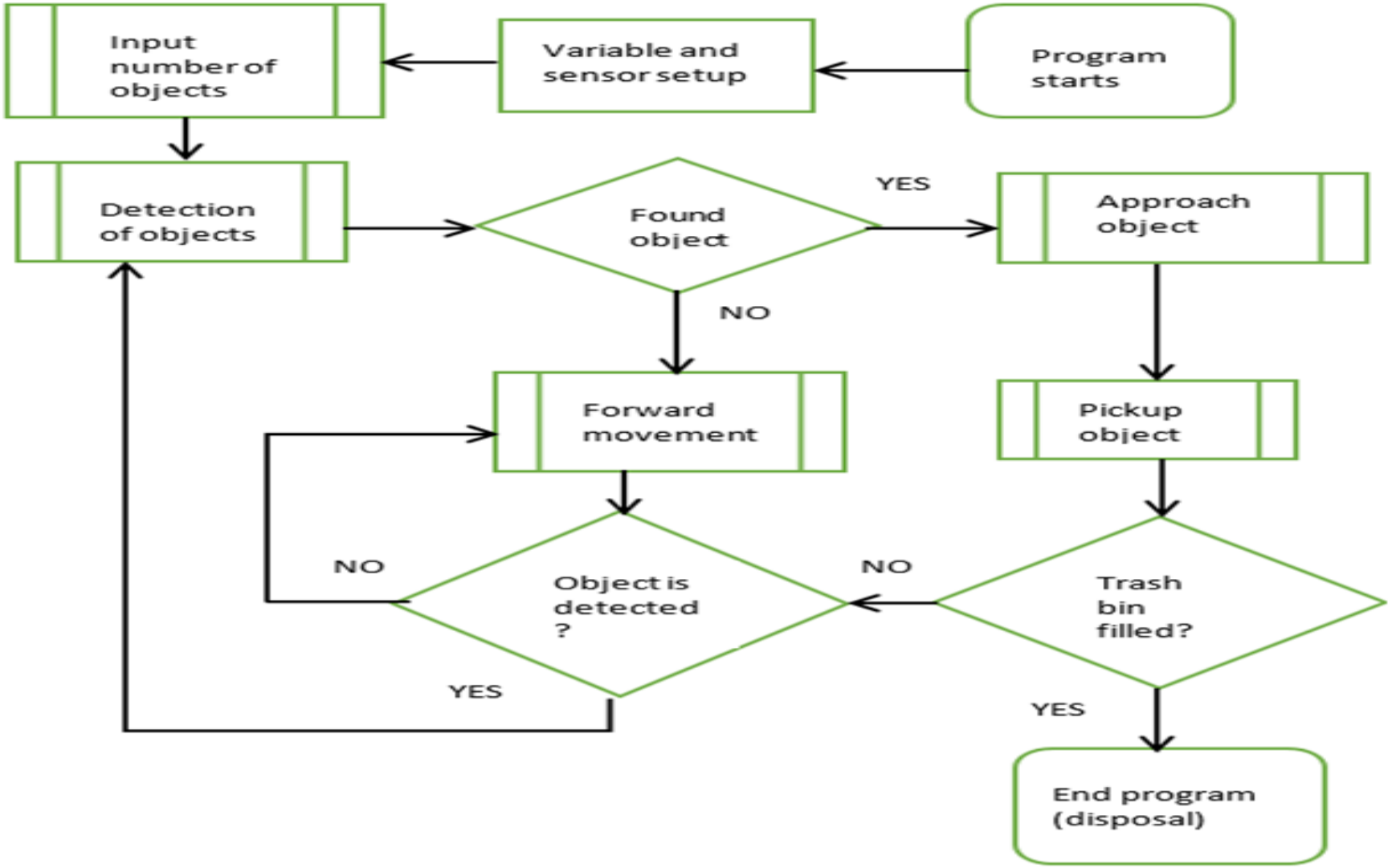
ROBOTICS MOVEMENT

- Rotational movement
- Radial movement
- Vertical movement

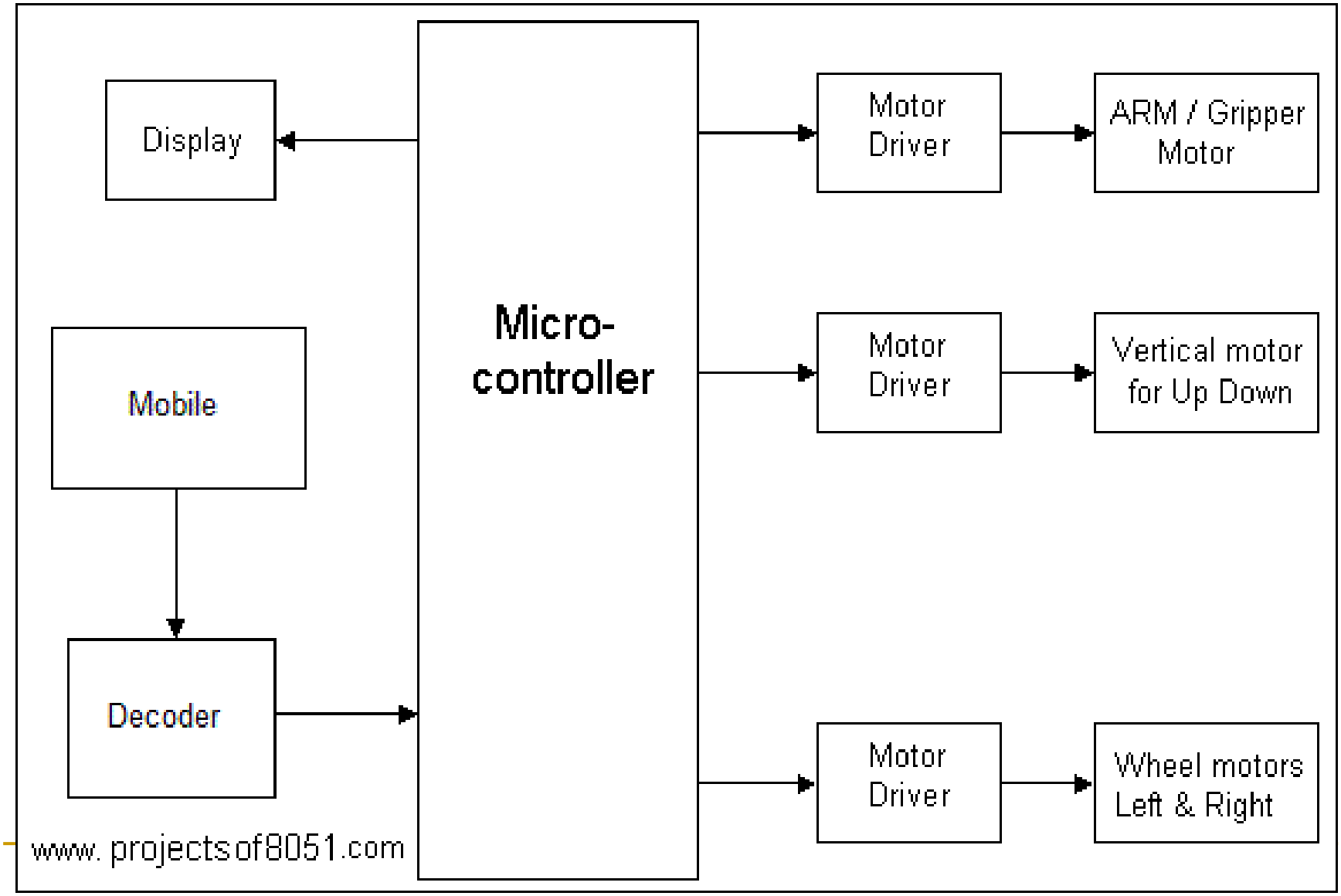
CONFIGURATIONS:



ALGORITHM


Input number of objects
Variable and sensor setup
Program starts
Detection of objects
Found object
YES
Approach object
NO
Forward movement
Pickup object
NO
Object is detected ?
NO
Trash bin filled?
YES
YES
End program (disposal)

BLOCK DIAGRAM :

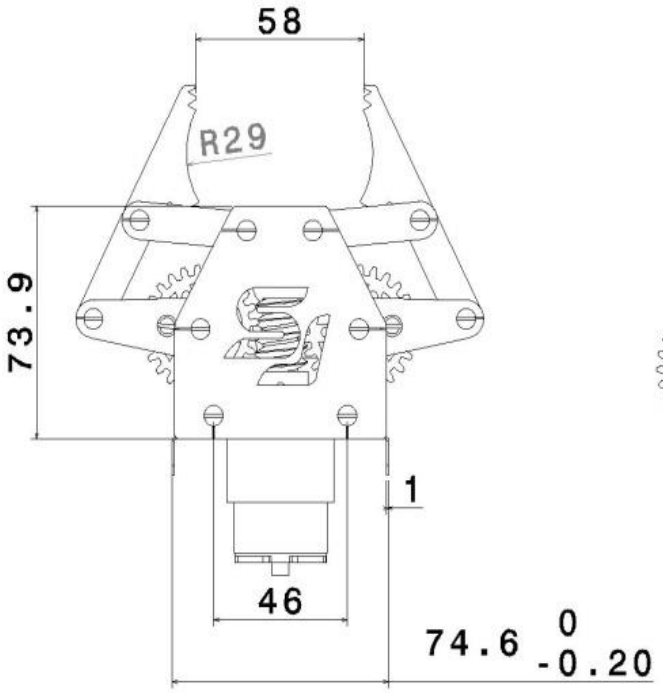


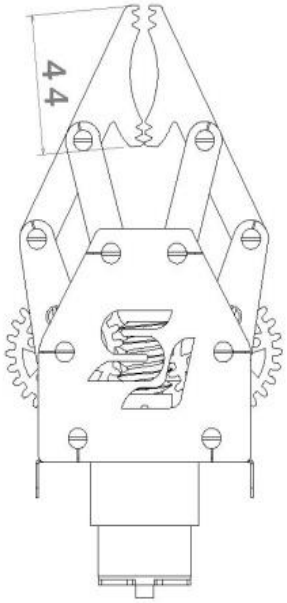
DC MOTER

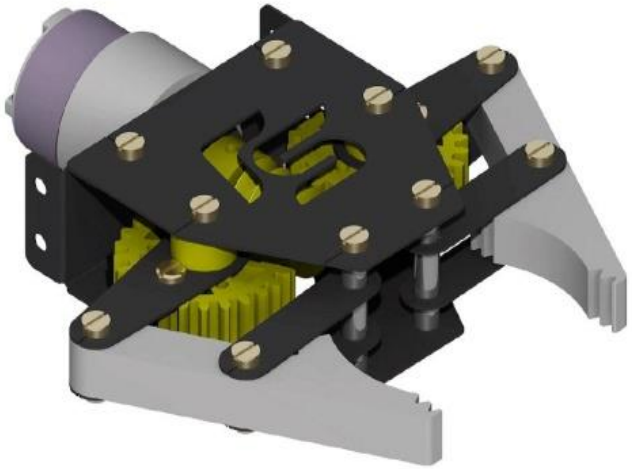
These are very commonly used in robotics. DC motors can rotate in both directions depending upon the polarity of current through the motor. These motors have free running torque and current ideally zero. These motors have high speed which can be reduced with the help of gears and traded off for torque. Speed Control of DC motors is done through Pulse Width Modulation techniques, i.e. sending the current in intermittent bursts. PWM can be generated by 555 timer IC.Varying current through the motor varies the torque.

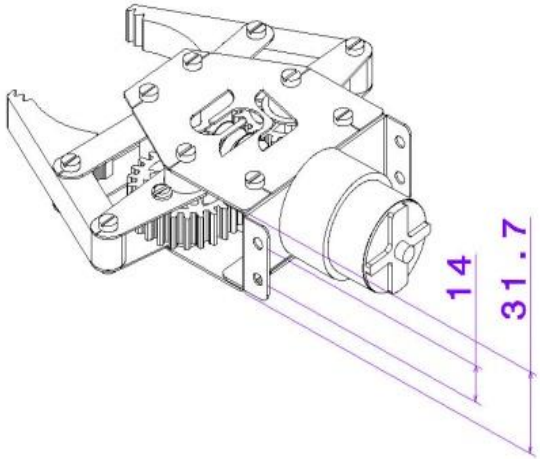
***GRIPPER ARM* :**

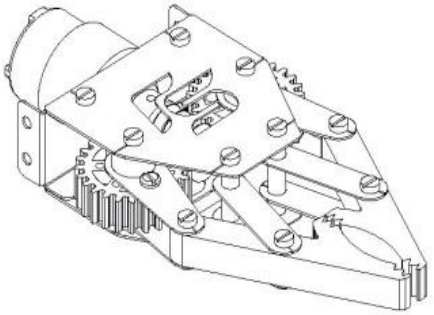
• The gripper module is state of the art robotic arm which can be used in various 'pick and place' kind of robots. It works on DC Motor (9 to 12V DC).
• Change in rotation direction of the DC Motor, generates Jaw Open & Close Action.
The DC motor can be easily be controlled with the help of DPDT Switch (manual mode) or with the help of any micro controller along with L293D Motor Driver module.











All Dimensions are in mm.

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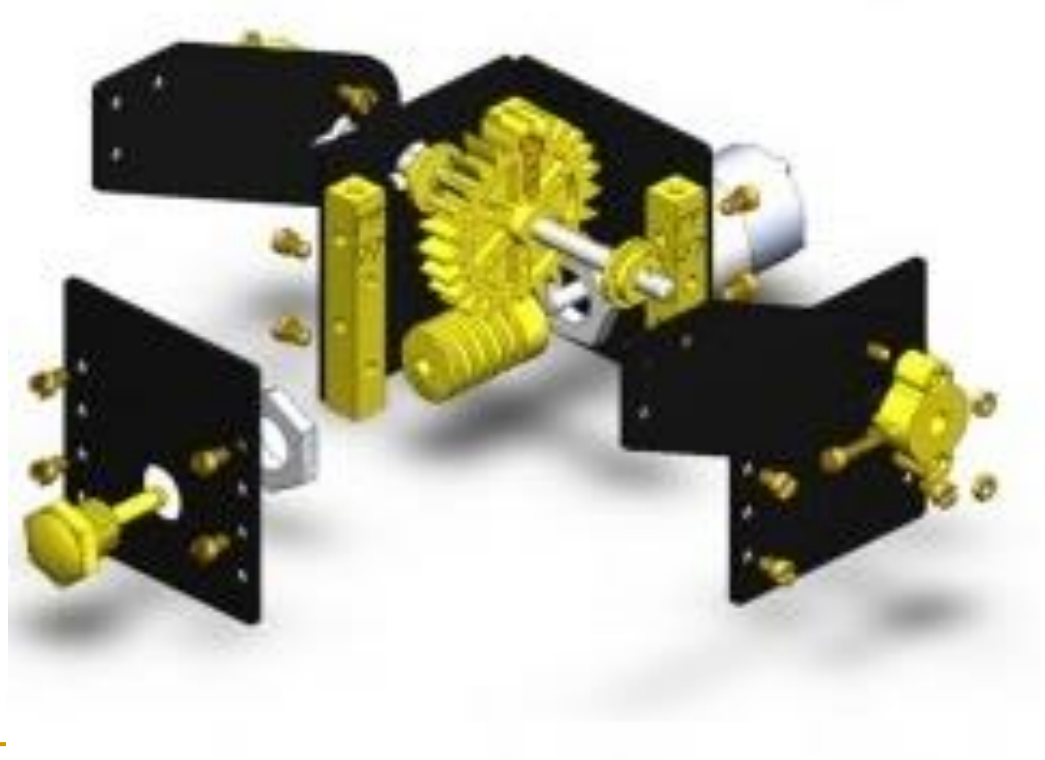
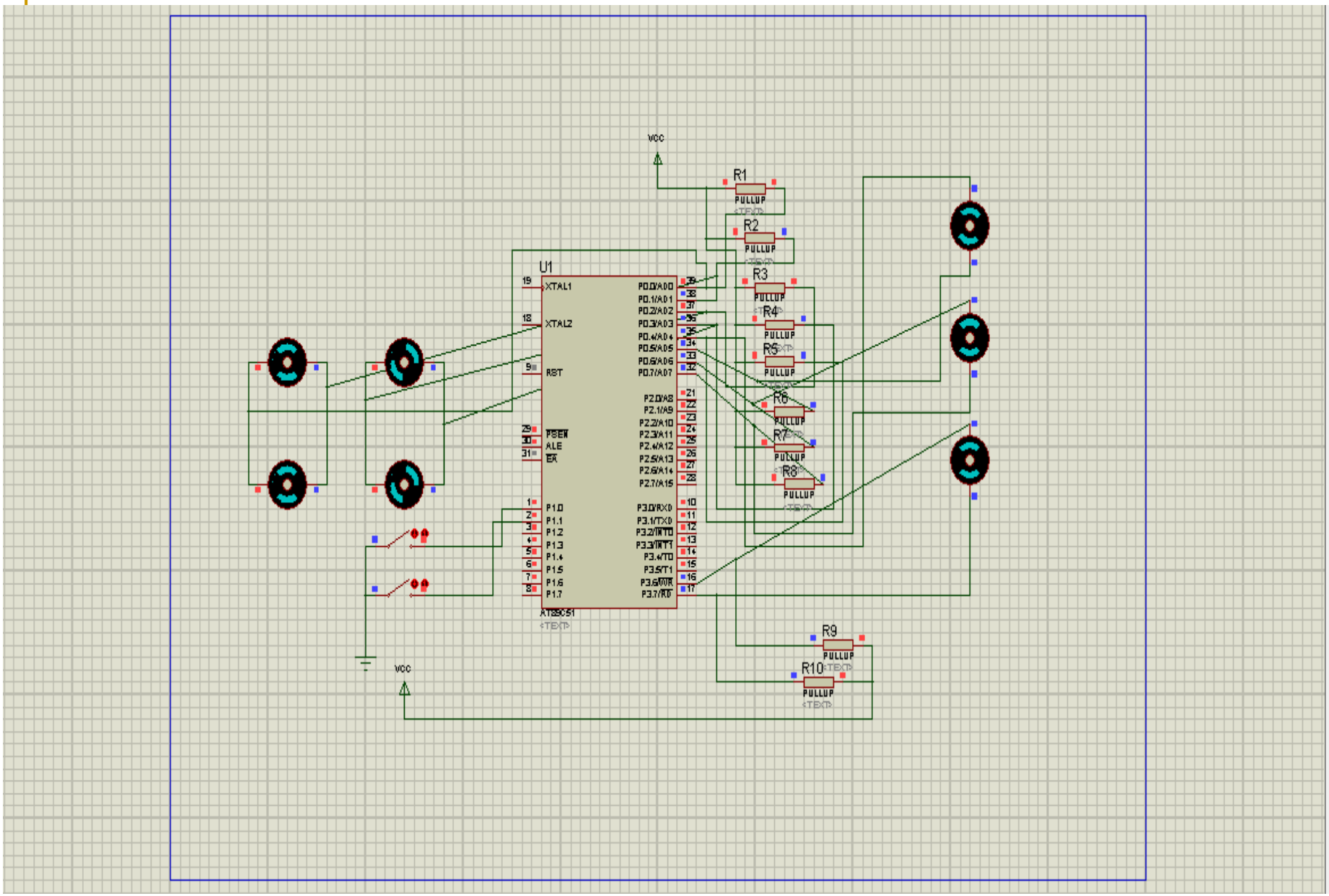
LIFTER ASSEMBLY:

It is made from laser cut Metal and acrylic. There is a worm gear and spur gear assembly which is attached with a DC motor (9 to 10 volt) to provide torque so that gripper can pick and lift the load.

- Gripper assembly Plates.
- Fiber Grippers-2nos.
- 45 RPM Motor-1nos.
- Worm Gear-1nos.
- Spur Gear-2nos.
- Different Screws and nuts.



CIRCUIT DIAGRAM:



SOFTWARE TOOLS :

KEIL SOFTWARE :

- Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

- ***DRIVERS&ARM ABSTRACTION :***

- The drivers provide the most basic interaction with the hardware, simply reading or writing a value when requested.
- the drivers would provide some extra functionality, such as changing the register address written in the PWM.
- For example, when we want the arm to move, it is easier to issue a move command that specifies the motor to move, the direction, the speed and the distance to move in one call.

APPLICATIONS

- Parts Transfer
- Bonding and Sealing
  Robots offer many benefits.
- They perform applications with exceptional consistency and repeatability.
- They remove workers from taxing, tedious, and often dangerous duties.

Dispensing

- Dispensing jobs require materials to be moved from one location to another. The consistent, accurate movements of industrial robots make them well suited for dispensing

Advantages of Dispensing Robots:-

- Precision
- Repeatability
- Work envelope
- Payload capacity
- safety

DEBURRING

- Robotic deburring is the material removal process used to take burrs, sharp edges, or fins off metal parts.

DEBURRING IMPACTS

- **VALUE:** Automated deburring cells grind, roll and file metal parts precisely.
- **PRODUCTION:** The robot can work long hours without fatigue to produce more throughput.
- **SPEED:** Automation is faster and more efficient than its human counterparts.
- **SAVINGS:** Deburring robots improve the application so product is created at a faster rate.

ADVANTAGES

- **Speed -** Pick and place robots allow for faster cycle times.
- **Accuracy -** Robotic systems are more accurate and consistent than their human counterparts.
- **Production -** Work cells create more because they perform applications with more accuracy, speed and tirelessness. The consistent output of a robotic system along with quality and repeatability are unmatched
- **Reliability -** Robots can work 24 hours a day, seven days a week without stopping or tiring.

Cont…

- **Flexibility -** Pick and place robots can be reprogrammable and tooling can be interchanged to provide for multiple applications.

- **Savings -** Managers are realizing the longtermsavings with a pick and place robotic workcell rather than the operation they are currently doing. An increase in output with a material handling robotic system has saved factories money.

- **Affordability -** With the advancements intechnology, and affordable robotics becoming available at less cost, more pick and place robotic cells are being installed for automation applications.

DISADVANTAGES

- Due to limited of its application is confined to few areas.
- If component is not in the reach of robot it take some time and may not reach location and pick object.

FUTURE APPLICATION

- Coal mining
- Military Operation
- Fire fighting Operation
- Undersea Robots
- Garbage Collection and Waste
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CONCLUSION

- Some industrial works are harmful for humans, robots are mainly used for reducing the risk process and time consumption and avoid labour.

- Humans are tired for hard work such as assembly line, material handling etc. So, Pick & Place Robots are the best alternate solution.

THANK YOU