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Designing of Pick and Place Application using Simulation Software

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Abstract - This project should be Designing Pick and Place Application using Moto Sim EG17 Software. The software is used to design a YASKAWA robot and an articulated industrial robotic arm with different grippers. The robot was designed using the moto sim EG17software to shorten the robot development time, and improve the speed and quality of the robot design. The moto sim EG17 software consist of four sections which is manual drawing, part module, assembly module and drawing module. Moto sim EG17software was chosen as it enables analysis and simulation of the pick and place industrial robotic arm design. The results of simulation Xpress study and motion study of the modelled articulated robot arm part and assembly are presented to demonstrate the pick and place robotics system. This project indicated that the moto sim EG17Software is a suitable tool that enabled the design of a robotic system to be carried out in a short duration.

Index Terms - Pick and place workstation, moto sim EG 17, Soft motion, Simulation Xpress study, motion study, gripper

INTRODUCTION

Robotics is a subject that leaves nobody indifferent. No matter if they are used to work in industry or at our homes, mimic some of the human capabilities, or used to access dangerous environments, launched to space, or simply used to play with, robots are always a source of interest and admiration. Here the focus is in robots used to work on industrial environments i.e., robots built to substitute man on certain industrial manufacturing tasks being a mechatronic co-worker for humans. In fact, actual manufacturing setups rely increasingly on technology. It is common to have all sources of equipment on the shop floor commanded by industrial computers or PLCs connected by an industrial network to other factory resources. Also, manufacturing systems are becoming more autonomous, requiring less operator intervention in daily operations. This is a consequence of today's market conditions, characterized by global competition, a strong pressure for better quality at lower prices, and products defined in part by the end-user. This means producing in small batches, never risking long stocks, and working to satisfy existing customer orders. Consequently, concepts like flexibility and agility are fundamental in actual manufacturing plants, requiring much more from the systems used on the shop floor. Flexible manufacturing systems take advantage of being composed by programmable equipment to implement most of its characteristics, which are supported by reconfigurable mechanical parts. Industrial robots are good examples of flexible manufacturing systems. Using robots in actual manufacturing platforms is, therefore, a decision to improve flexibility and to increase the agility of the manufacturing process. If the manufacturing processes are complex, with a low cycle time, and have a lot of parameterization due to the diversity integrate other technologies with the objective of extracting from robots the flexibility they can offer. That means using computers for controlling and supervising manufacturing systems, industrial networks, and distributed software architectures [2,3]. It also means designing application software that is really distributed on the shop floor, taking advantage of the flexibility installed by using programmable equipment. Finally, it means taking special care of the human machine interfaces (HMI), i.e., the devices, interfaces, and systems that enable humans and machines to cooperate on the shop floor as co-workers, taking advantage of each other's capabilities. of products, then using robots is the correct decision, although it isn't enough for a complete solution.

I. Applications of Industrial robots

The following robotic applications are the most common in the automotive industry:

- Collaborative Robots.

These collaborative robots are built to work together with other robots, on enormous assembly lines. Robots must collaborate between handling and welding robots to make such assembly lines function properly.

- Robotic Painting

Professional painters are difficult to find and the job is a highly toxic one. This makes it perfect for robots, because the paint job needs to be highly consistent over a large area of paint, and reducing the amount of wasted material can add up to quite a bit of savings over time.

- Robotic Welding

Robotic welding has been the top robotic application in the automotive sector for a long time, as every car needs a high number of welds before it’s complete. Given the high value of the finished product, productivity from automation is enormous.

- Robotic Assembly

In many automotive plants, robots are assembling smaller components like pumps and motors at high speeds. Often, robots are performing tasks like windshield installation and wheel mounting to increase throughput.

- Material Removal

High consistency and repeatability make robots perfect for material removal processes like trimming and cutting. This could be in the form of cutting fabrics, trimming plastic mouldings and die castings or even polishing moulds.

- Part Transfer and Machine Tending

Pouring molten metal, transferring metal stamps, and loading and unloading CNC machines are all best completed by a robot as they are dangerous. When completed consistently with little downtime they can also be a source of major productivity.

II. APPLICATIONS OF PICK AND PLACE INDUSTRIAL ROBOT

- **Defence application**

It can be used for surveillance and also to pick up harmful objects like bombs and diffuse them safely.

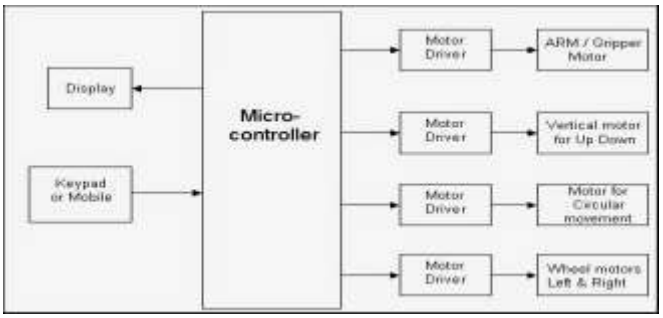
- **Industrial applications**

Pick and place robots are used in manufacturing, to pick up the required parts and place it in correct position to complete the machinery fixtures. It can be also used to place objects on the conveyer belt as well as pick up defective products from the conveyer belt.

- **Medical applications**

These robots can be used in various surgical operations like in joint replacement operations, orthopaedic and internal surgery operations. It performs the operation with more precision and accuracy.

BLOCK DIAGRAM FOR PICK AND PLACE ROBOT



I. HARDWARE COMPONENTS ROVER

Fig: 1. Rover

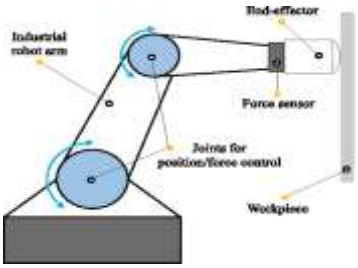


Fig: 2. End effector

It is the main body of the robot consisting of several rigid bodies like cylinder or a sphere, joints and link. It is also known as a manipulator.

Fig: 3. Magnetic gripper

II. VACCUM GRIPPER

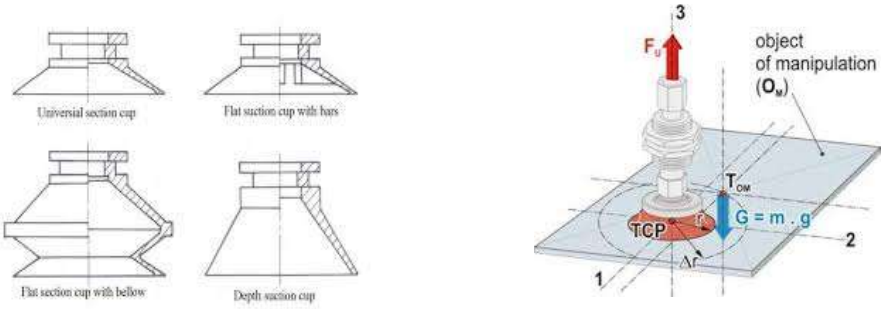


Fig: 4. Vacuum gripper

Vacuum cup grippers are those devices that actually grip an object for moving or placing it within the working range with vacuum cup type gripping system. If the end-effectors vacuum cup type is not suited to the task, the task cannot be carried out satisfactorily. End-effectors are usually specifically designed for their particular task, because the highest workload of on-site construction consists of handling and assembly operations, the vacuum cup gripper is most interesting in this area. It uses vacuum cupsFig.1are the gripping device which is also commonly known as suction cups. This type of grippers will provide good handling if the objects are smooth, flat, and clean and stored in cartoons. It is only for one surface of gripping the objects. The two grasping devices can be actuated independently for single object. Grippers grasp and manipulate objects during the work cycle. Typically, the objects grasped are work parts that need to be loaded or unloaded from one station to another.

III. *2.4 SENSORS*

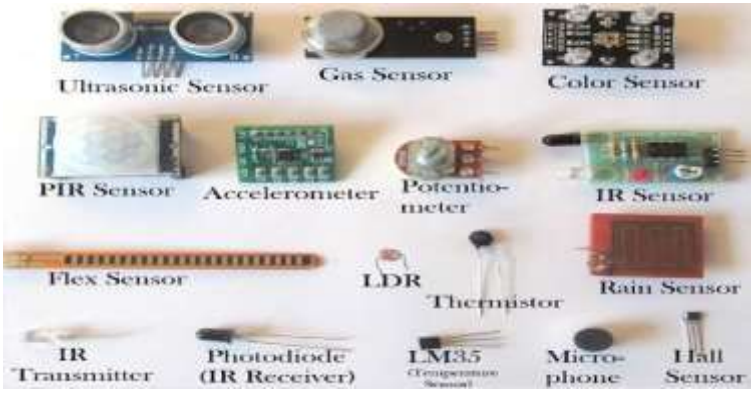


Fig 5. Sensors

There are numerous definitions as to what a sensor is but I would like to define a Sensor as an input device which provides an output (signal) with respect to a specific physical quantity (input).

The term “input device” in the definition of a Sensor means that it is part of a bigger system which provides input to a main control system (like a Processor or a Microcontroller).

Another unique definition of a Sensor is as follows: It is a device that converts signals from one energy domain to electrical domain. The definition of the Sensor can be understood if we take an example in to consideration.

IV. 2.5 MOTORS

Motor is a machine or device that converts any form of energy in to mechanical energy, or imparts motion. In constricting a robot, motor plays an important role as to give movement to the robot. In general motor operates with the effect of conductor current and the permanent magnetic field. The conductor with current will produce magnetic field which will react with the magnetic field produces by the permanent magnet to make the motor rotate.

There are three basic types of motors which are commonly being used in building a robot. DC Motor, Servo Motor Stepper motor

V. 2.6 ACTUATORS

Actuators are mechanical or electro mechanical devices that provide controlled and sometimes limited movements or positioning which are operated electrically, manually, or by various fluids such as air, hydraulics etc. two basic motions are linear and rotary. Linear actuators convert energy into straight line motions typically for positioning application and usually have a push and pull function. Some linear actuators are unpowered and manually operated by use of a rotating knob or handwheel. rotatory actuators convert energy to provide rotary motion. A typical use is the control of various valves such as ball valves or butterfly valves. Each actuator type has versions for various power configurations and come in many styles and sizes depending on the application. Linear chain actuators provide push and pull motions with rigid chains.

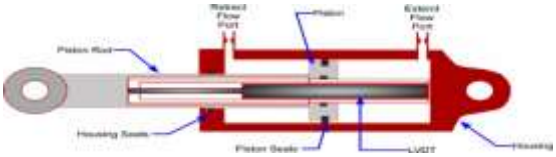


Fig 6. ACTUATOR

SOFTWARE INSTALLATION

VI. Environment required for MOTOSIM EG

0S	Microsoft windows 10 (64 bits) Microsoft windows 7 service pack 1 JAPANESE and ENGLISH windows version are supported only
CPU	Intel or core 2 DUO or more multi core processor
Memory	2GB or more
Hardware disk	1GB or more
Monitor	Supported by MS-windows (256 colours or more)
Hard ware key	Used under single user environment
other	Graphic board for 3D

VII. CELL CONSTRUCTION

Cell is a file in which MOTOSIM EG simulation environmental data are recorded. Folder information to store the operation contents, model file information such as robots, workpieces or tools, data of operational environmental layout, etc. is recorded.

Cell construction are as follows

When new cell dialogue box appears, enter any cell name: a folder where cells are parameter data, model data, job data, etc. are stored can also be set.

After entering the cell name and give [ok]. A new cell with a floor model appears

Robot adding: After creating the new floor model click on add to add the robot

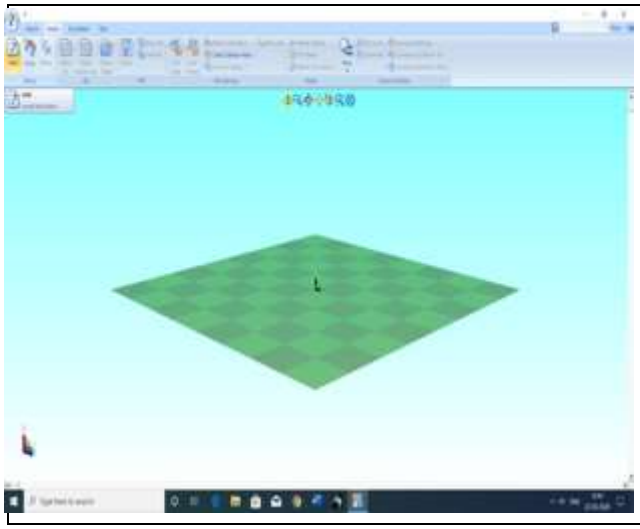


Fig 7. Creating of new floor model

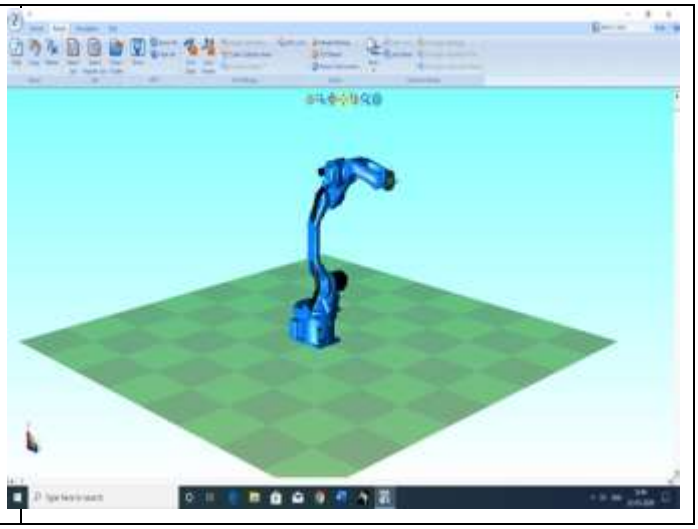


Fig 8. Creating of new robot

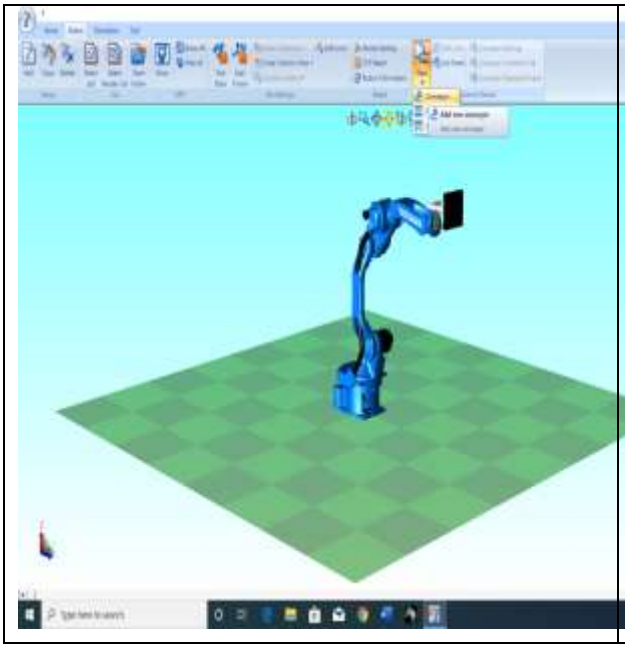


Fig 9. We have to select conveyor for that click on NO.1 in conveyor installation box

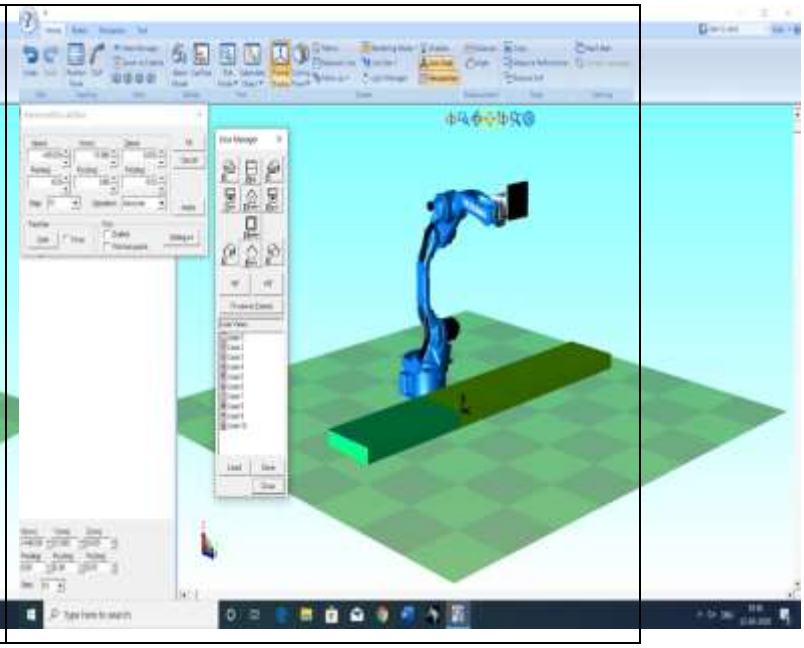


Fig 10. ADDING DESK ON THE CONVEYOR

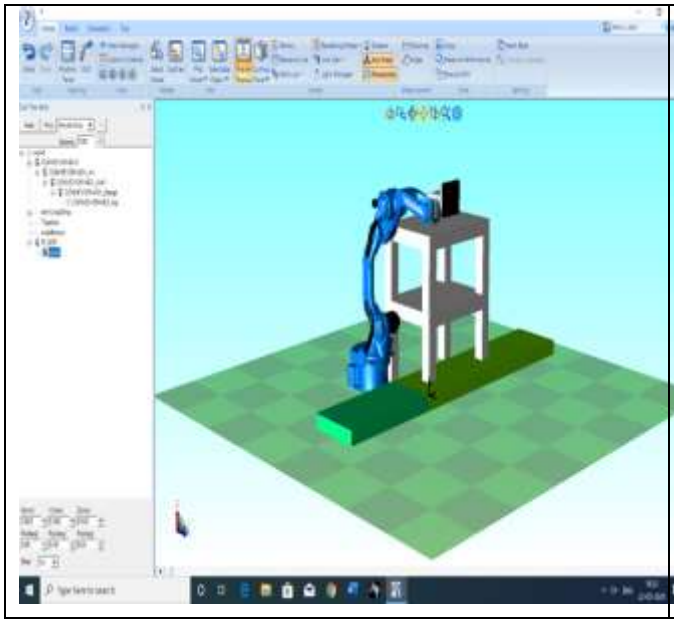


Fig 11. Selecting box by box in the desk bar

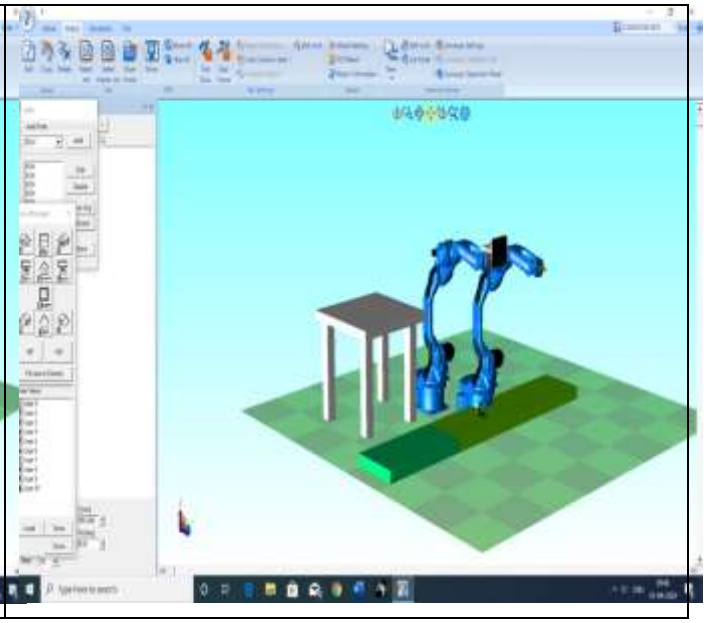
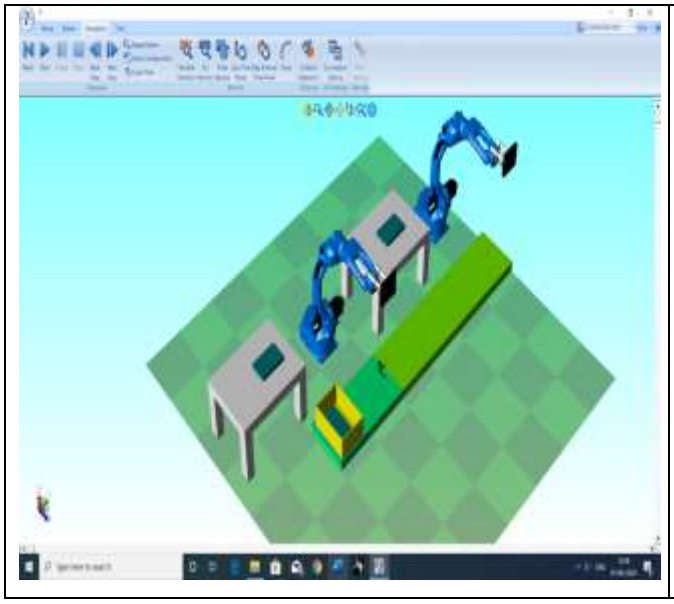
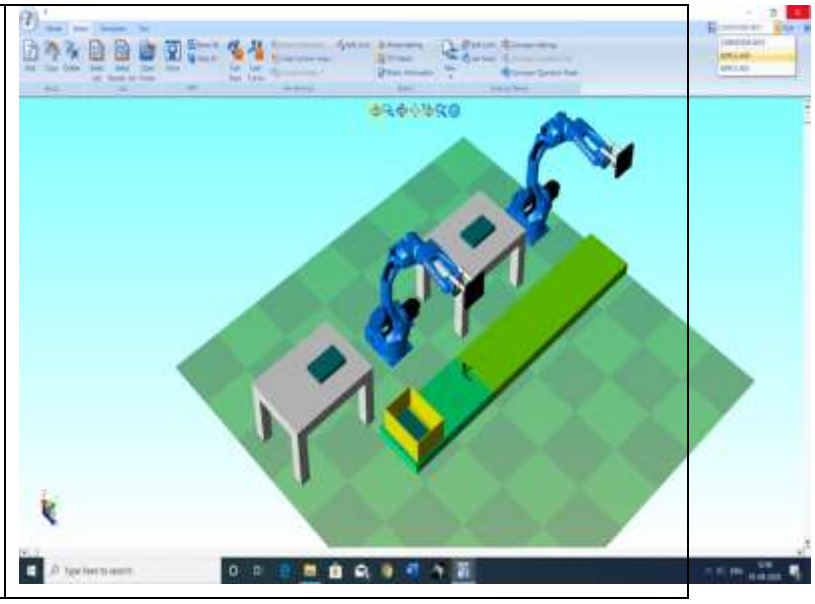


Fig 12. Adjusting the robot

Adding box on conveyor and also adding the block on the desk and inside of the box.

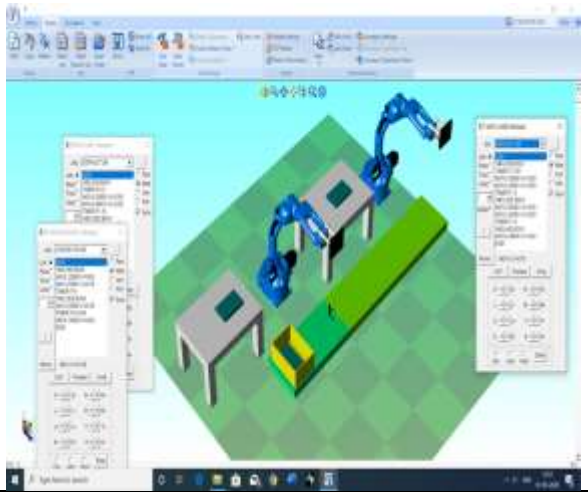


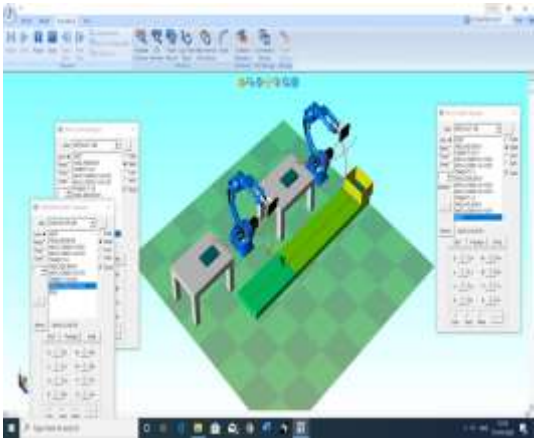
Using MH12.A00 teach pendant we have to give the 2nd robot.



Using MH12.A01 teach pendant we have to give the coding to the coding to the 1st robot.

OUTPUT





CONCLUSION

This robot is used for the pick and place the object from one place to another place. Concepts of automobiles and robotics are combined in this project. Transmission of power due to meshing of gear is used for lifting purpose.

FUTURE SCOPE

It Can be used to interact with the household objects and observing the help of camera systems.

And also it Can be used for accurate holding and inspection application in the industries.

- It can be used for a pick and place application in the industries like soap, manufacturing, pharmacy e.t.c

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