

## MODELLING AND SIMULATION OF A PICK AND PLACE ROBOT USING MOTO SIM

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**Abstract** This paper presents the model and simulation of Pick and Place robot using Moto Sim EG17 Software. By using this software, an articulated Yaskawa pick and place Robot with a griper was developed. The developed Robot is used 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.

**Keywords:** Pick and place workstation; moto sim EG 17; soft motion; simulation Xpress study; motion study; gripper.

### 1. INTRODUCTION

A pick-and-place robot is a mechatronic system used to automate the process of picking up objects and placing them onto a surface in a set position and orientation. This action is frequently used to sort or stage products in a specific array for a downstream process, such as case-packing, where fixed machinery or another robot can properly handle the products.

Khairadeen Ali [1] et al provided a data set for a pick and place robot for the construction site. Their data set provided a optimized location for robot arm in the job site reducing the robot collision with surrounding objects.

Gharehgozli et al [2] studied the operation problem of scheduling a mobile robot satisfying a mobile robot satisfying a set of customer orders from a pick station with minimum total travel time.

Seyyedhasani et al [3] presented a modelling frame work and stochastic simulation for robot aided harvesting. They gathered data from two strawberry fields. They found the non-productive time is reduced and the harvest efficiency is improved in the robot aided harvesting.

Feng et al [4] proposed mathematical model for cycle pick and place tasks. They considered with different configurations and found optimal pick and place configuration in order to maximize the energy saving.

Patwadhan et al [5] developed methodology to create a CAD model of a existing physical Nex Dexter 5 axis robot. They exported CAD files using different parameters. They developed a Teach pendant app using Visual C.

Srasrisom et al [6] discussed the development of an automated loading and unloading system for aluminium bowl embossing operation on a power press machine. They used CAD for modelling and Delmia V6 for simulation.

Juntao et al [7] introduced machine learning and to develop a set of rules to integrate in the pin packing optimization. Nemeth et al presented a set of modules developed in the Siemens plant simulation software. This software automatically creates the modules of robotic assembly system with AGV based material handling.

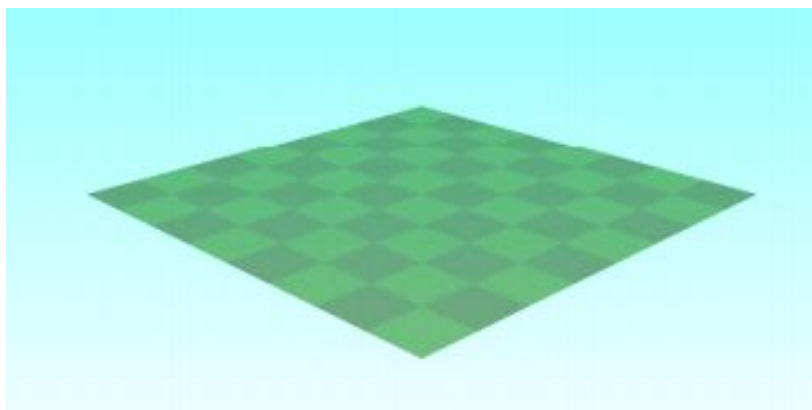
Baskar et al [8] studied the simulation of various human andromorphic model to discuss the limitation to perform the assembly task based on gender, weight and height. They developed a mobile robot to provide physical assistance to the human to perform assembly operation.

Nair et al [9] developed graphical user interface for factory workers with programming competency. They created robot programs by combining the blocks using the simulation software to visualize, analysis and optimize robotic workflow before deployment.

Hanson et al [10] addressed the application of automation in warehouse order picking robot mobile fulfilment system in an ecommerce setting.

## 2. CELL CONSTRUCTION

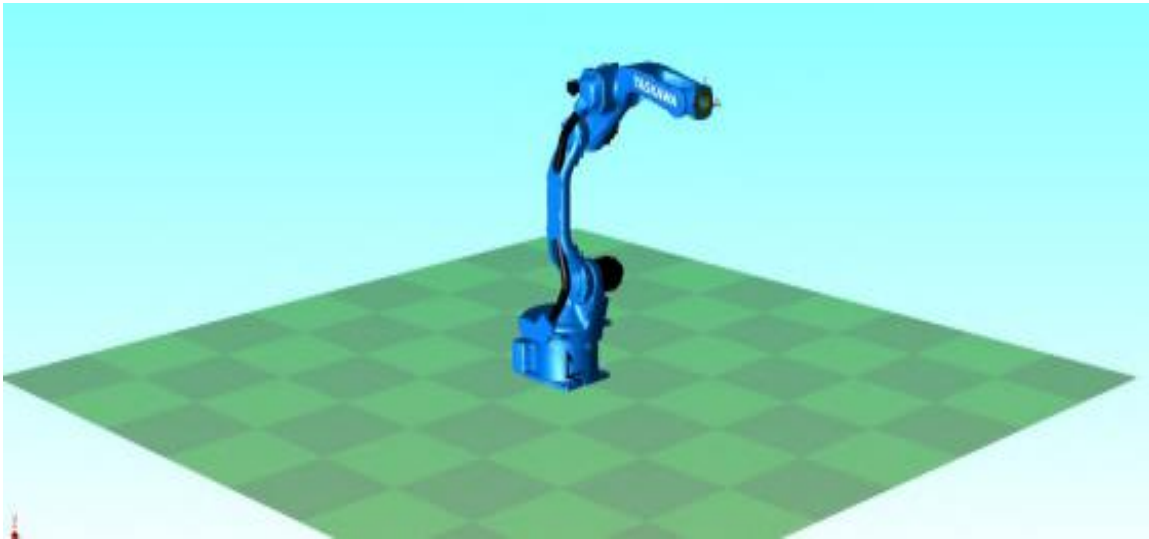
The Motoman program is clicked to run Motosim Software. A new cell dialogue box is opened. A new folder is created which contained parameter data, model data and job data etc. A new cell with only a floor model is appeared in Figure 1.



**Figure1. Floor model.**

The virtual controller is registered and this controller will boot the system. After booting up is completed, the virtual pendant is displayed and the controller is rebooted in the normal operation

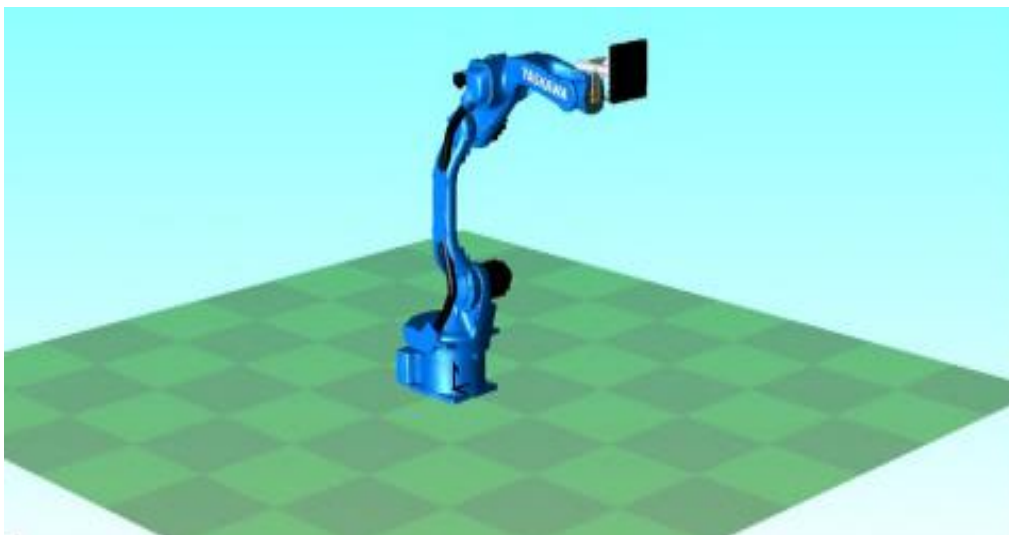
mode. After the controller registration is completed, the robot model is appeared in the screen as shown in the Figure 2.



**Figure 2. Manipulator in the screen.**

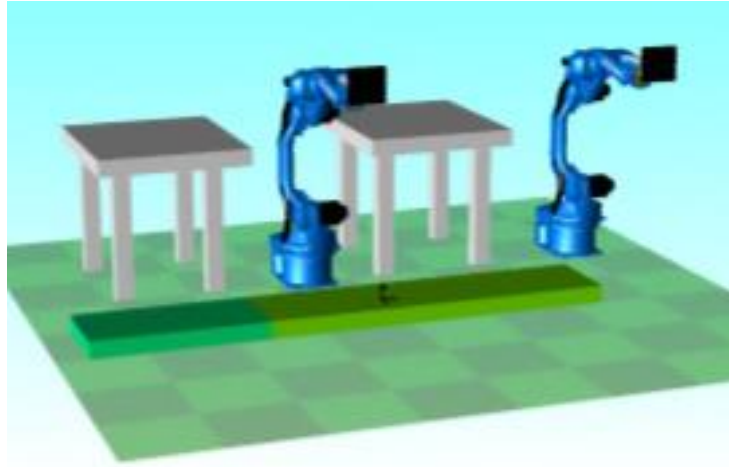
### 3.MODELS CREATION

The workpiece models and tool models are created using the CAD function. The work piece stands are created in the CAD tree. The BOX model is added in the file data. The Model size, conveyor and stands are done in done in BOX edit. A tool model is created with the CAD function.



**Figure 3. Manipulator with end effector.**

Manipulator with an end effector, two manipulators with two stands and a desk on conveyor are shown in Figure 3 and Figure 4 respectively.



**Figure 4. Two manipulators with two tables and a desk on conveyor.**

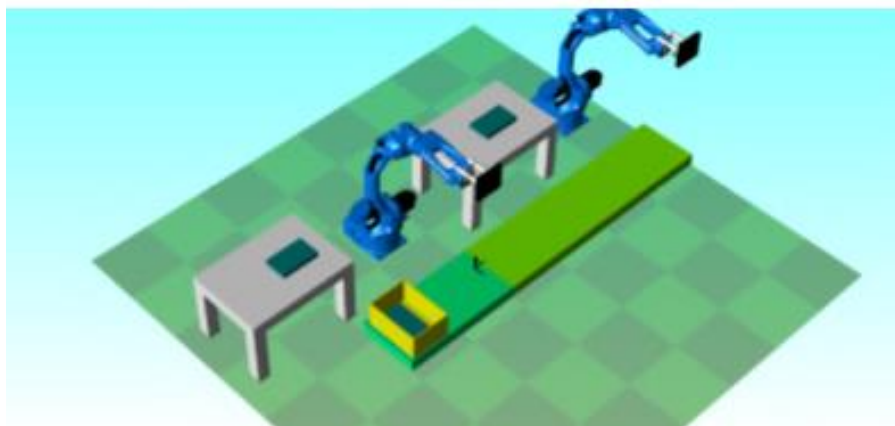
## **4. TEACHING AND PLAY BACK**

The pick and place job is selected. The stand by position is fixed. the robot is moved to the pickup place. After the workpiece is grasped and the grasped workpiece is placed in the drop off location. Then the robot will return to the stand by position.

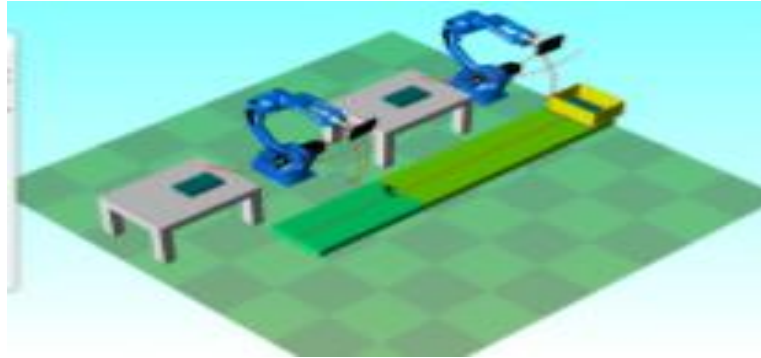
In the virtual pendant, the job cursor is moved on the top of the job. Job execution button is clicked to perform the playback and the movement is checked. After the playback is completed, the play pack time is displayed and traced.

## **5.SIMULATION**

The Motosim software display shows the cell layout and the robot motion in 3D environment. The cursor in the job is moved to the first step as the virtual pendant and robot position is set to the position of the starting of the job.The pick and place job is currently selected and executed and the cycle time noted.



**Figure 5. Readiness of the first robot in picking of the object.**



**Figure 6. Readiness of the second robot in placing the object.**

## 6. CONCLUSION

The modelling and simulation of Articulated Yaskawa pick and place robot with a gripper was developed. The cell construction, teaching, play back and simulation were comfortably and quickly done using Motosim software. This software will be used for spot welding, arc welding etc.

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