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SIMULATION OF ROBOTICASSEMBLY OF SUSPENSION COMPONENTS TO A CAR UNDERBODY USING IRB 7600 ROBOT

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Abstract: *Simulation of a robotized pick and place operation before a real world process during the course of time became a valuable asset in automobile industry. By considering a car under body for simulation of a robotized pick and place operation .Here ABB IRB 7600 robot is used for picking of the car under body (Hood) component and to install it. Moreover, the process time for the operation can be optimized by alternating appropriate parameters of robot speed and their settings. The simulation of robotized pick and place results without collision of any other obstacles in its path, problem detection, precise robot programming and lead time. This project is designed for precise placement of Suspension Elements at the fixed locations in the car under body. We use three-finger gripper along with ABB IRB 7600 Industrial Robot for the project.*

Key Words: Simulation, IRB 7600, Lead time, Precise Robot Programming, Hood.

1. INTRODUCTION

In early years, factory production lines were automated for mass production, and many industrial robots and specialized machines were introduced. For this increase for production rate and accuracy now a day's industries are in use of Robots valued for the best qualities of machines untiring availability, predictability, reliability, precision and imperviousness to hostile environment. A Simulation creates a virtual application with the robots through embedded systems without completely depending upon the physical components of a machine.

1.1 Shocks and Struts

Struts are the suspension part of an automobile for absorbing the shocks and impact loads due to uneven ground in motion. For most reliable sophisticated and best quality of the ride on road struts a most applicable in automobiles from many years. Apart from keeping the tyres firmly on the road and the vehicle from leaning on while in turn have shock free and good condition helps us to be under safety. Most of the shock absorbers or struts can lead along stop at distances, increase the breaking efficiency and decreases the skidding effect in pavement. So for most efficient durability and quality it's much useful to make it more efficient in working which can be done by automations. But it was too costly in implementation for which it's better for simulating the actual process in virtual reality before making on track. As before making a trail of this costly making we use simulation before processing.

1.2 Simulation and Robot studio

Simulation is a model development of a real time member with their key characteristics or functions. Application of simulation in robotics creates a virtual model of robotics in including the design and programming code. By using a simulation for robots, we can be programme by off-line which does not create any down-time for an assembly line that may greatly depend on these robots. In general pick and place operation requires more time accuracy and perfection throughout. For which we use Robot which is proportionately a new application in the field of any types of industrial.

Robot studio is a powerful off-line robot programming and simulation tool. The first version was delivered in the year 1998, which creates the robots movements which simulates and optimise

the really existing program. Robots can also be operated by remote control using teach pendent. The Robotstudio is a well suited tool for its best use in both online and offline programming. Robotstudio helps in creating sequence of activities through off-line program , Designing robot world , defining robot motion.

RobotStudio is a highly sophisticated, advance simulation and off-line programming software with a number of excellent features and benefits. Some of these features are:

1. 3D-simulation-environment- representation of robotics system
2. Virtual Controller - the real robot controller embedded in your PC
3. Robot Library - exact models of the entire ABB robot product line
4. Virtual Teach Pendant -perfect for training operators off-line
5. RAPID Program Editor - automatic program error checking
6. I/O Simulator - interact with simulated inputs/outputs
7. Visual Basic for Applications - develop your own functionality

2. LITERATURE REVIEW

From [1][2][3] references, the delegates from Indo Euro Synchronisation Germany had delivered their vast knowledge and experience in the ABB IRB 7600 applications.[5] This unique methodology had a numerical controlled system that integrates the Trans Pulse Synergic Metal Inert Gas (MIG Metal Active Gas (MAG) welding process for near-net layer deposition and Computer Numerical Control (CNC) milling process fornet shaping).[6] Gasparetto et al (2007) described a new method for smooth trajectory planning of robot manipulators [10]. In order to ensure that the resulting trajectory is smooth enough, an objective function containing a term proportional to the integral of the squared jerk (defined as the derivative of the acceleration) along the trajectory was considered. [7]Several studies have been done to investigate intuitive ways to move and teach robots, using input devices, such as joysticks (Nagata et al., 2001) or digital pens (Pires et al., 2007). Owing to its low price and specific characteristics (Section 2.2), the Wi-Fi remote controller was selected to be the input device of our system, a wireless device with motion and infrared sensing capabilities. Several studies have been done to investigate intuitive ways to move and teach robots, using input devices, such as joysticks (Nagata et al., 2001) or digital pens (Pires et al., 2007). Owing to its low price and specific characteristics (Section 2.2), the Wii remote controller was selected to be the input device of our system, a wireless device with motion and infrared sensing capabilities.[11] This paper reports on the development of line follower mobile robot correlated with ABB industrial robot manipulator. The line follower mobile robot is a prototype model design and fabricated for material handling purpose. Thus, hardware components as well as software programming are concurrently developed with each other.

Extensive work has been reported in the literature of simulation of robotized pick and place operation of suspension elements. Gasparetto et al (2007) described a new method for smooth trajectory planning of robot manipulators. Robotics is a branch of technical sciences which deals with construction of designs, operation and application purposes and computer systems for their feedback sensors. The advanced robotics has improved a lot in the field of industries. Here, In my project I clearly worked on the assembly of suspension elements in car under body.

I worked on Nissan and Maruthi Suzuki show room for the study of car under body and suspension part i.e, strut, to take the dimensions of the part. Then took the design of both car under body and strut and for further process.

3. ROBOTISED ASSEMBLY

Robotic assembly are used for recline industrial process and have expanded production capabilities in the manufacturing industries. An assembly line robot can increase production speed and consistency. Assembly robots also help workers from irrigative assembly jobs. It is considered as the automatic process for industry level and some of the benefits of robotised assembly are:

a. The operation goes on in a systematic process
b. It has higher production rate than manual process

c. Needs less labour
d. Takes less time to complete the process
e. It takes accurate result.

4. METHODOLOGY

A systematic way of processing used in particular study of a concept. The basic data was collected as above mentioned in the literature section and the simulation of the entire assembling process is done by using the software.

- Design of a car under body and suspension system elements (struts) in catia v5 R18 software.
- Import the design elements to robotstudio
- Stipulate an appropriate robot with a tool for assembly operation
- Trace the path for assembling of suspension parts by a rapid program.
- Execute the program in real time application.

5. SIMULATION USING ROBOTSTUDIO

In this paper, car under body component and suspension elements struts are designed in CATIA V5 R18 and has been simulated by ABB RobotStudio software 6.02.01 version. The components designed in CATIA are saved as it is preferable in iges format. The components have been fabricated and imported to ABB RobotStudio software. The RobotStudio software is used for the dynamic assembly of the suspension element in car under body part. After the components are imported to work cell they are set to a desired position. The car under body component imported is placed on the table and fixed for static constraint while in operation. The suspension components are placed in nearby position on a table which is imported from library. The path of the assembly line is selected in points as a continuous path. By enabling the process timer on, the process time is calculated. The programming for a robot to trace the path is formed and is simulated by using RobotStudio software, where the program generated is uploaded virtual controller to ABB robot controller to save some time.

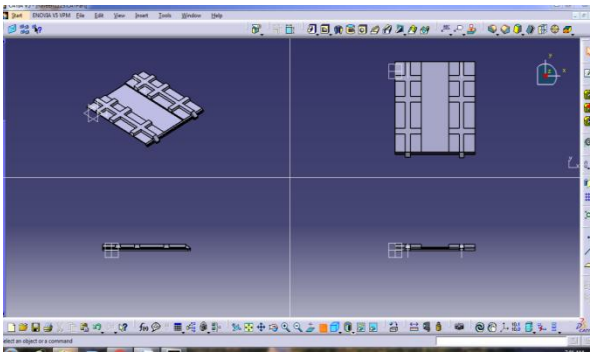


FIGURE NO 1: DESIGN OF CAR UNDER BODY

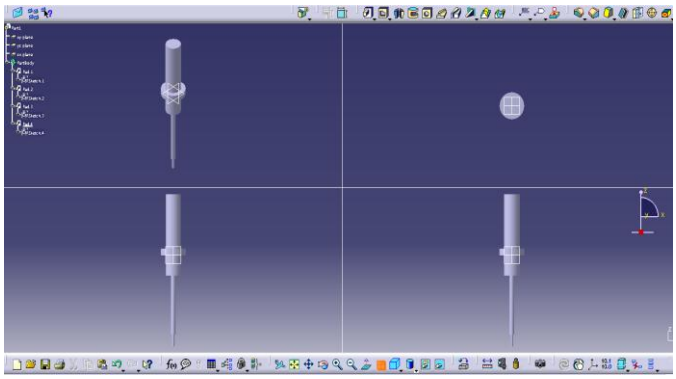


FIGURE NO 2: DESIGN OF SUSPENSION ELEMENT (STRUT)

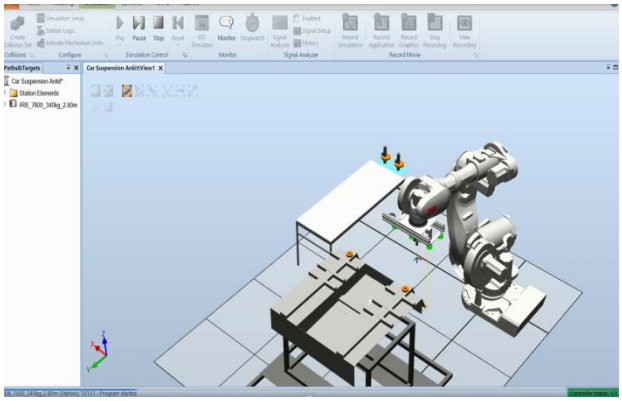


FIGURE NO 3: ROBOTIZED POSITION SENSOR

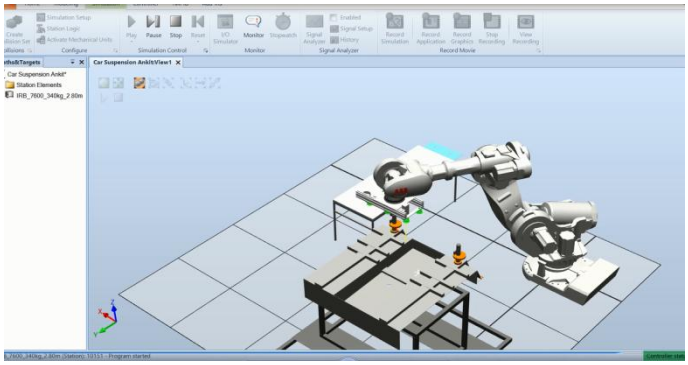
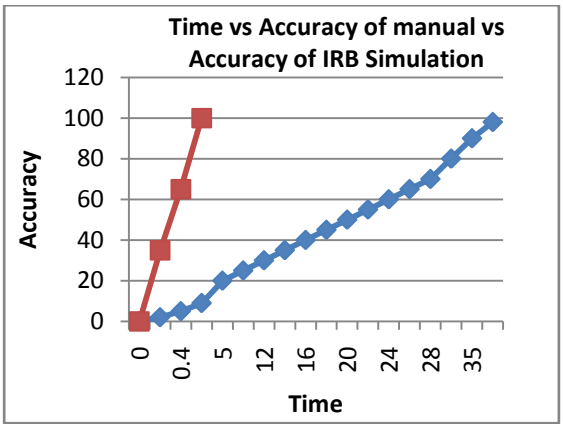


FIGURE NO 4: ROBOTIZED ASSEMBLE



7. CONCLUSION

In this work, RobotStudio has been used for the simulation of a robotized Assembly operation. Simulation has been done for a Car under body. Bydoing the simulation the time for programming has been saved. A major concern with robots handling payloads of up to 500 kg is protecting personnel and the robot in the unlikely event of an accident. The function Collision Detection reduces collision force substantially. An Electronically Stabilized Path will ensure that the robot maintains its planned path at maximum capacity while taking acceleration, drag, gravity and inertia into consideration. This feature is secured through our True Move. Active Brake System controls the braking while ensuring the robot maintains its path. To achieve optimimum performance, the robot adapts to true payloads through its Self-tuning Performance. . As taken from the reference[19] of the community college philadelphai-car suspension and struts experimental theory in 2007, the time taken for manual assembly of car suspension system to a car underbody is 50 minutes.This feature is based on Quick Move. As a result, ABB has added a range of software products all falling under the umbrella of Active and Passive Safety and reduces the Time taken for the programming and execution by precise way 10 min. Time taken for the task (lead time and processing) 20 minutes totally it takes 30 minutes to complete the task which is a main parameter.

8. REFERENCE

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