STUDY OF INDUSTRIAL AUTOMATION WITH MECHATRONIC SYSTEM USING VARIOUS TECHNOLOGY EMBEDDED
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Abstract
In the modern world, speed is the most decisive factor between winning and losing. This faster is better rule impacts modern industry in a huge way.

In today’s modern digital era, software based systems are becoming an indispensable component in industrial world. During the industrial progression, human civilization has experienced numerous industrial revolutions. Now the world is undergoing Hi tech industrial revolution with information technology having automation, digitization computer network and artificial intelligence as its main factors. Mechatronics is a new developing technology in the evolutionary procedure of contemporary engineering strategy.

Mechatronics with operative real time software plays a vital role in any application that has a very great potential in system development. To accomplish high Precision manufacturing, software based systems are extensively used to automate numerous processes.

1. Introduction
Today, the Mechatronics with embedded technology is getting widespread in all industrial applications. All Industries are targeting to focus on digital industrial unit. In order to get digital industrial unit, the application of electronics and software is a essential for all industries to streamline the products, processes and technologies.

The software based system comprises of diverse hardware and software units for retrieving the real time data and manufacturing the requisite outputs. Assimilating the hardware units with software units in the real time situation is not an easy task, it depends on several factors such as voltage, software logics, Technical system, Control and communication system, Software Control signal, technical system, design factors, etc.

An automated system consists of three basic elements.
1. Power to accomplish the process and operate the system
2. A program of instructions to direct the process, and
3. A control system to activate the instructions.

Advanced automation functions
Advanced automation functions include the following.
1. Safety monitoring
3. Error detection and recovery.

(MECHAtics - electRONICS)
The combination of mechanical and electronic systems. Embracing robotics, industrial control systems and human interfaces in numerous disciplines, mechatronics is a major step beyond “electromechanical”
Mechatronics is “Putting intelligence onto a physical system”
- A basic mechanical structure which generates a certain carrying behavior or movement.
- Sensors collecting information on the system or the environment.
- Processors evaluating the information and generating correcting variables according to certain rules.
- Actuators in which the correcting variables are converted into forces, movements, electrical voltages or other quantities which act on the basic system or its environment.

Components of Mechatronic system

- Electro-mechanics (electro pneumatics, electro hydraulic)
- Mechanics Software (Animated motion)
- Electronic Software (PLC, PC)
- Mechatronic system (System theory)

Scope

As Mechatronics is the new emerging technology in today’s Scenario, it is spreading its wings in every sphere of life whether it is a Defence, industry, medical field, automotive, robotics and many others. Therefore this study offers great scope for the future aspiring researchers who wants to research in the same and make life easier in industries and also to get optimum efficiency and good products.

Technical Overview

Several mechatronic engineers’ work with the electronic instrumentation and computer control systems as nearly all machinery relies on them for effective and consistent operation. Automatic systems monitor works for plants to detect leaks and faults if any, and help the plant to operate all the year round. Mechatronic engineers construct and design these systems and require proficiency in computing and electronics, core mechanical engineering, and the talent to bring these together to create working systems that is matches the safety and reliability levels.

Mechatronic engineers also play a significant role in project engineering, reliability engineering and power engineering where their cross-disciplinary skills gives them an upper hand on mechanical or electrical engineers. Mechatronic engineers are capable of working with electrical and mechanical systems simultaneously and can recognize and resolve glitches that cross restraint borders. Mechatronic engineering, encompasses wide collaboration with people working in more traditional engineering branches.

2. Description of the System.

The System was controlled on emerging technologies, but the base was the control system which require various tools or technology. These technologies were used in combination with each other ie. emmbedded with each other to perform the desire task. This task may be Automatic, Semi – Automatic or Manual, based on requirement and need.
The Technologies are Pneumatic, Hydraulic, PLC, Sensorics, Mechatronics and Robotics, apart from that Electric & Electronic controls and many more.

In Mechatronics (mMS kit) there are three stations namely Magazine station, Processing station with Pneumatic press unit and Storage station having Cartesian Robot.
The word mMS stands for Modular Mechatronic System. Basically the process of an Automation plant is divided into three steps, the Raw material is fed from Magazine and tested on testing bench equipped with various sensors. Then it is shifted to press unit where it is assembled with another part, and picked by handling robot to place it in storage rack for packaging, which is the final product.

The details of the system are in three steps.

1. Magazine Station
2. Processing Station
3. Storage Station

**Station 1 – mMS – Magazine Station**

The Magazine station consists of

- 2 separating magazine
- Long conveyor belt
- Testing unit
- Control panel
- Maintenance unit
- Electrical supply with signal processing
  - Main switch on the multiple output socket
  - Power supply (24VDC)
  - Emergency stop relay
  - Profibus coupler
- PLC

**Station – 2 – mMS – Processing Station with pneumatic press**

The Processing station consists of

- Pneumatic press
- Portal
- Handling device
- Turning unit
- Pins unit
- Control panel
- Short conveyor belt
- Electrical supply with signal processing
  - Power supply (24VDC)
  - Emergency stop relay
  - Profibus coupler
- PLC

**Station – 3 – mMS – Storage Station**

The Storage Station consists of

- High bay racking
- Cartesian robot
- Handling device
- Maintenance unit
- Control panel

Main switch on multiple output socket
- Power supply

Emergency stop relay
- Terminating plug on the transfer module
- Profibus coupler

**Electrical Circuit diagram**

3. **Pneumatic connection**:

4. **Results and evaluation**

The entire system is controlled using Electro–Pneumatic control, PLC and Sensors to increase the efficiency.

The operation can be done in Manual as well as Auto. It is helpful to all Industries for increasing efficiency.

5. **Conclusions and further work** -

The Entire Sysytem for industrial automation is useful for increasing Productivity.
The further work is to implement the system using Internet & RFID. This will enhance the effectiveness, precision and accuracy.

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