AN INNOVATION DEVELOPMENT OF ELEGANT INDUSTRIAL MANAGEMENT WITH ARTIFICIAL INTELLIGENCE PROCESS EXECUTION USING SEMI-MACHINE LEARNING

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Abstract

In general, the use of machinery is on the rise today. Their use is increasing to the extent that their use and assistance from homes to factories is so elegant that it makes even the most difficult work easier. And some specific factories operate on the performance of machines rather than their manpower. In this paper a method is proposed to improve the applications of the existing machines and to further increase its efficiency. Its design methods are designed to easily handle some of the complex problems faced in the industry and to embrace its design and advanced sophisticated methods. Its accuracy and its processing are constantly updated and designed so that its calculations are comparable each time. Its performance has been enhanced by improved methods of industrial automation and accuracy has been increased to 98.7%. This smart industrial Automation method of production and other production processes increases the production rate by producing more output for a given labor input and also the Human intervention suddenly falls to control processes, using automated machinery and equipment. This reduces the investment in labor cost, hence the cost of production also reduced.

Keywords:

Industrial Management, Industrial Automation, Machine Learning, Production

1. INTRODUCTION

To solve automation and control problems, businesses use ever-changing technologies in control systems for efficient production or production processes. These require high quality and reliable control systems. New trends in industrial automation involve the use of the latest control devices and communication protocols to control field devices such as control valves and other end control components [1]. Some smart devices or tools used in the automation industry have the ability to control processes and communicate without interfering with other domain level control devices such as PLC. Industrial automation is the PC. Is the use of various control devices such as PLC/DCS, which are used to control the various functions of an industry and provide automatic control performance without significant intervention from humans [2]. In industries, control strategies use a set of technologies that are implemented to achieve the desired performance or output, which makes the automation system highly desirable for industries. Industrial automation includes layer controls, PLC's state-of-the-art control hardware devices, control variables sensors and other equipment, control devices, signaling conditioning equipment to connect signals with drivers and other significant end control devices, complete system systems, communication systems, hazardous and HMI (Human Machine Interface) systems [3]. In some important applications, the process variable must be checked periodically to perform industrial functions. Automation equipment establishes automated working conditions by minimizing specific or manual operations [5].

Industrial automation systems are widely used in today's world to automate processes. Under this common name refers to a variety of electrical, pulmonary and electronic devices, such as belts, machine tools engaged in the manufacture of the system in various logistics and other industries. An integral part of any manufacturing process is to provide an uninterrupted power supply, because it can bring severe losses to any simple company [6]. The industrial equipment segment includes such as independent equipment, and built-in components, which reflects the function of manufacturing processes. As for individual units, they can most indirectly contribute to the tax characteristics without directly relating to its capacity. Now it is necessary to consider whether the functions are carried out by technical equipment or as part of an industrial complex. Its main objectives are to reduce processing time, consistent quality of products, increase product number, reduce and brighten labor service personnel, and so on [7]. The Maintenance equipment, machine tools and technical possibilities are there to achieve these goals by most effectively implementing ready-made operations with the help of expansion elements.

2. LITERATURE REVIEW

Lee et al [2] analyzed the challenges and opportunities within the design and development process of IoT. Although all the processes that are carried out in IoT system are promising, it seems a bit complicated to face some technical glitches in implementing this. Its full benefits can only be reaped if these enhanced IoT frameworks are implemented more precisely.

Banks et al. [4] summarized a development and validation of a metric for humans and social machines. In that, some machine model algorithms determine how a human-robot should work. But there is no emphasis on understanding or any other kind of feeling. Thus, robots are in a position to accept a given job but need to thoroughly test whether humans can accept that amount of work.

Caiado et al. [8] introduced a fuzzy rule-based industry 4.0 maturity models for operations and supply chain management. The Digital tools effectively handle the work that usually determines the productivity of upgraded factories. It is a good choice not only for industrial production but also for its practical problems. It also handles the small caps that are in the industry and most of the factories are shifting to this method of mass production.

Leitão et al. [9] introduced an Industrial automation based on cyber-physical systems technologies. In this system the applications of internet service gain importance for the advancement and growth of the industry. And the prototypes with internet service technology in the automobile industry have realized their basic needs.

The Artificial intelligence and machine learning in dynamic cyber risk analytics was developed by Radanliev et al. [10] was developed to monitor existing machines or human activities on the edge. Its main task is to ensure cyber security in those places. This ensures that all work is done efficiently

3. PROPOSED SYSTEM

The structure of proposed artificial intelligence process execution (AIPE) in industrial automation describes the operation of various levels, including sensor level, automation control level (unit, cell, process controls), monitoring level, and organizational level. The pyramid structure refers to the accumulation of information as you ascend to the top and dissolve as you descend. This means we get detailed information for a specific variable below. Industrial automation does not mean that all levels operate automatically as organizational levels do not have to be automated.

3.1 AUTOMATION SYSTEM

The sensor level is also called the process layer. It uses sensors and actuators to obtain continuous or periodic values of process variables. These act as eyes and weapons of industrial processes. Some of these tools include tool tools, smart devices, and so on. Automation control level or control layer uses industrial control devices such as PC/PLC/DCS. Various embedded processors use PIT algorithms to control this level of operation.

- **Sensors and Actuators**: A sensor senses various process variables and converts them into electrical or optical signals. These sensors include temperature, pressure, speed, and flow. Converts electrical signals into mechanical means to gain control over processes. These include relays, magnets, servomotors, and more. Some sensors and actuators have the ability to interact with industrial field communication buses that come under smart devices.
- **Human Machine Interface (HMI)**: HMI provides information such as displaying information on computer screens and other displays, recording results in a database, and giving alarm signals. It uses SCADA (Supervision Control and Data Acquisition) and other display-based technologies.

3.2 AUTOMATION LAYERS

The monitoring level or SCADA layer receives a lot of channel information and stores the data in the system database. It receives data from various control devices and displays them in HMI's (Human Machine Interface). It provides an alarm to indicate the size of the process and to control the variables. It uses specialized software to obtain data and communication protocols to communicate with field devices. Performs tasks such as organizational level planning, ordering and sales, product planning. Automation systems are classified into four basic types based on the level of flexibility and integration in production processes. They are described below Fig.1.

Industrial computers: The Programmable logic controllers (PLCs) are also called industrial computers that are designed to perform certain control functions. It consists of a CPU or processor, I/O modules (both analog and digital) to connect various inputs/output devices and relay modules. These may be modular with standard typing integrated types to extend modules based on inputs. With PLC, regular PCs can be used to control the process online or by switching programs. The PLC with specialized software to plans is used for the control strategy.

Communication system: The controls of many sensors, actuators, PCs and other control devices in the industry are geographically distributed and communicate with each other via multiple data buses. Three types of buses are used in industrial automation i.e., factory bus, process bus and field bus. The field communicates between the bus field tools and the control devices, while the process connects the bus monitoring level computers with the control devices such as the PLC. The Connects the upper level of the factory bus system to the oversight level. Different protocols are used for communications such as RS-485, profibus, CAN control modbus.

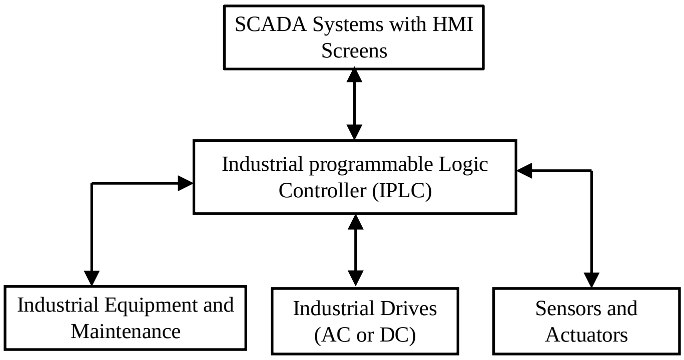

Fig.1. Proposed System Architecture

3.3 PROPOSED SYSTEM LAYERS

Standard automation layer: This sequence of operations to be performed is adjusted by the equipment configuration. It is used in mass production with dedicated equipment. Examples of this automation system are automatic assembly lines, filtration process, machine transmission lines.

- **Programmable Automation Layer**: In this, you can change the sequence of functions by changing the column. The sequence of operations will vary based on different product configurations. New programs can be inserted into programmable devices for new products. This type of system is used in block processes, steel rolling mills, industrial robots, etc.
- **Flexible Automation Layer**: This is an extension for programmable automation. This provides greater flexibility to deal with product design variations. Operators can issue commands in the form of codes in the computer program if they want to change the order of operation. Lower level equipment receives instructions to operate at the field level without wasting production time. This type of automation is used to manufacture multi-purpose CNC machines, automatic guided vehicles, etc.
- **Integrated Automation Layer**: This type of bulk system is fully automated under computer control. From the design

process to the dispatch, the whole system works completely automatically. Equipment is also handled by robots. This system is used in computer integrated production systems.

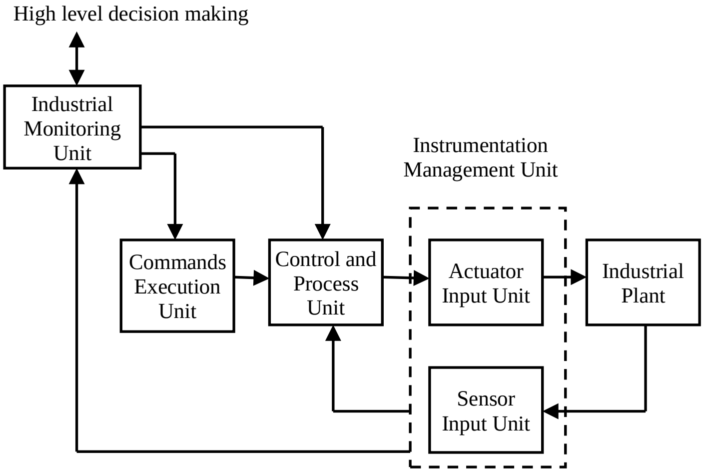

Fig.2. Proposed system design

Continuing to do the same work based on quality specifications with human work may not be appropriate in all cases. With automation tools, one can achieve reliable and consistent product quality by using real-time hardware control devices. The process is simply handled using various automation tools, especially without getting into any complicated situation in the production process shown in Fig.2. Industrial automation reduces the complexity of operating equipment or processes. This changes the operator status of the operator to a supervisory role.

4. RESULTS AND DISCUSSION

The proposed artificial intelligence process execution (AIPE) model was compared with the existing Human Machine interfacing algorithm (HMIA), A fuzzy rule-based industry 4.0 maturity model (FRBI), Industrial automation based on cyber-physical systems (IACPS) and machine learning in dynamic cyber risk analytics (MLDCA)

4.1 BIG DATA MANAGEMENT

In general, big data management is the process of effectively managing the excess information in a database. Due to its efficient use only the authorized data present in the database is used. Authorized data unnecessary data will not be allowed to enter. Thus, the blocking storage of the unauthorized data was restricted. Most storage space is handled efficiently if unwanted data is not stored.

Then, the unauthorized data blocking of a system is given by

$$Data\,Management = \sum_{s=1}^{h} D_j \tag{1}$$

where, D_j is dented here the total number of data entered the system

The Table.1 presents the analysis of data blocking between existing HMIA, FRBI, IACPS, MLDCA and proposed AIPE.

Table.1. Analysis of Data management in (%)

Instruction Execution	HMIA	FRBI	IACPS	MLDCA	AIPE
1500	71.29	76.07	66.18	68.98	93.35
2500	70.96	74.57	65.59	67.11	92.31
3500	69.62	73.46	64.61	66.28	92.18
4500	68.48	73.08	63.4	65.37	91.22
5500	67.43	72.07	62.26	64.45	91.65

4.2 ARTIFICIAL INTELLIGENCE MANAGEMENT

Artificial intelligence management is the efficient handling of excess data provided. That is, how to quickly take action on information through artificial intelligence and implement it immediately. To the extent that it has its potential the results will be correct. Also some data that was too much of the data given at the specified time may not even is processed. Thus artificial intelligence management calculates how much data is left. The efficiency calculation of this method refers to the fact that less data is not executed at that particular time.

AI Management $x(t)$= (dropped instructions under the active production (x,t)/(non block instructions arrivals under production time (x,t)) (2)

The Table.2 presents the analysis of dropped instructions between existing HMIA, FRBI, IACPS, MLDCA and proposed AIPE.

Table.2 Analysis of Dropped instructions in (%)

Instruction Execution	HMIA	FRBI	IACPS	MLDCA	AIPE
1500	28.71	23.93	33.82	31.02	6.65
2500	29.04	25.43	34.41	32.89	7.69
3500	30.38	26.54	35.39	33.72	7.82
4500	31.52	26.92	36.6	34.63	8.78
5500	32.57	27.93	37.74	35.55	8.35

4.3 MECHANICAL MANAGEMENT

The Mechanical management refers to the relationship between the work done by human and mechanical element at a given time and the speed at which that particular method is used. That is, it calculates how much work can be done at what speed at a time when human-machine interaction is concentrated. This will increase the quality of the work. It is important to note that the size and speed of the machines do not change according to the speed of the humans

Mechanical management (%)=((Total no. of works completed))/(speed of the work)× 100 (3)

The Table.3 presents the analysis of mechanical management between existing HMIA, FRBI, IACPS, MLDCA and proposed AIPE.

Table.3. Analysis of mechanical management in (%)

Instruction Execution	HMIA	FRBI	IACPS	MLDCA	AIPE
1500	79.05	84.49	75.28	73	97.03

2500	79.38	85.99	75.87	74.87	98.07
3500	80.72	87.1	76.85	75.7	98.2
4500	81.86	87.48	78.06	76.61	99.16
5500	82.91	88.49	79.2	77.53	98.73

4.4 ACCURACY MEASUREMENT

The Accuracy is the parameter which describes the ratio between perfectly predicted measurements from the given security measurements to the total number of collected measurements. When the rate of accuracy is high then the given system is getting high quality rate.

Accuracy Measurement=(Positive True Measurements+Negative True measurements)/(Total No. of measurements) (4)

The Table.4 represents the comparison of accuracy for the existing AHP, TOPSIS, HFLT, VIKOR and proposed IoTM

Table.4. Accuracy Comparison in (%)

Instruction Execution	HMIA	FRBI	IACPS	MLDCA	AIPE
1500	74.29	80.14	69.76	70.22	94.97
2500	73.95	78.73	69.02	69.35	93.42
3500	73.03	77.51	68.61	68.25	93.09
4500	71.76	76.91	66.89	67.25	91.45
5500	70.5	75.36	66.59	66.52	90.72

5. CONCLUSION

Industrial engineers evaluate and develop efficient systems that integrate workers, machinery, materials, information and energy to streamline production or other processes. To maximize efficiency, industrial engineers carefully study product requirements and then design production and information systems to meet those needs with the help of mathematical methods and models. They can convert the car production line to a slim production system. Or, they can read and provide options to reduce the length of the waiting lines in a theme area. The proposed artificial intelligence process execution (AIPE) model was getting high level output information while compared with the existing Human Machine interfacing algorithm (HMIA), A fuzzy rule-based industry 4.0 maturity model (FRBI), Industrial automation based on cyber-physical systems (IACPS) and machine learning in dynamic cyber risk analytics (MLDCA). Many industrial engineers switch to management positions because the task is closely related to the work of managers. Depending on the area they are focusing on, they may observe the current facility and view the addition of workers' parts or control inventory, energy consumption or production time at different hours of the day. They are both problem solvers and system builders.

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