Importance of Human-Machine Interface in Artificial Intelligence and Data Science

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***Abstract*-This paper presents about the topic of Human-Machine Interface (HMI) in Artificial Intelligence (AI) and data science. Human-Machine Interface (HMI) is how people and automated systems interact and communicate with each other. The most important task of the Human-Machine Interface (HMI) is to display complex process variables quickly and concisely, for easy interpretation of production information.**

The Human-Machine Interface (HMI) is used in Robotics including manufacturing plants, pharmaceuticals, etc. It can also be used in bottling processes to control aspects like speed, efficiency, error detection, etc. In future, Human-Machine Interface (HMI) can be utilized for new technologies.

In this paper, authors provide information about Human-Machine Interface (HMI) in data science and its applications and the provide the future scope of Human-Machine Interface (HMI).

Keywords: Human- Machine Interface (HMI), Artificial Intelligence (AI), Data science, automated systems, Robotics, industries, communication, sensors.

INTRODUCTION

Artificial Intelligence is the intelligence that is possessed by the machines. Algorithms in Artificial intelligence are used to perform independent Actions. Data Science is the emerging leading technology for the industries in this era. Data is very important part of industries for making the decision or prediction, forecasting and finalized the strategy of business.

Human-Machine Interface (HMI) is about how people and automated systems interact and communicate with each other. A Human-Machine Interface is a user interface or dashboard that connects a person to a machine, system, or device. The Human-Machine Interface (HMI) comes in a

variety of forms, from built-in screens on machines, to computer monitors, etc. The most important task of the Human-Machine Interface (HMI) is to display complex process variables quickly and concisely, for easy interpretation of production information. The three basic types of Human-Machine Interface are- pushbutton replacer, the data handler, and overseer.

Human-Machine Interface (HMI) is a primary tool that industrial operators and line supervisors rely on for the coordination and control of manufacturing or industrial processes, typically in a plant environment. Implementing cyber security has software, hardware and human components. Humans must implement policies such as using strong passwords and not reveling them, software must be kept up to date with patches that fix its vulnerabilities. Antivirus software and firewalls can help prevent unauthorized access to private data.

Human-Machine Interface (HMI) is widely used in manufacturing- from the automotive industry to the highly regulated pharmaceutical and food industries. The Human-Machine Interface (HMI). It allows you to communicate with any production system.

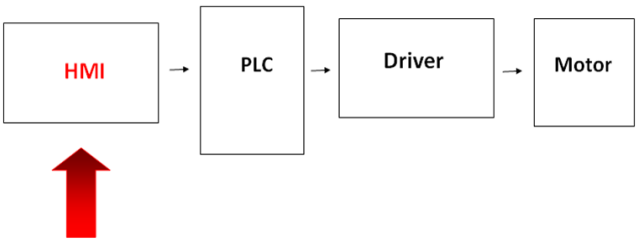

Fig 1: Block diagram of HMI

Human-Machine Interface (HMI) is a graphical interface. With these interface humans being and machines interact with each other. An HMI is the centralized control unit. Here, the figure shows, it must first work with the Programmable Logical Controller (PLC) that takes the information from the sensors and transforms it to Boolean algebra, so the HMI can make decisions.

II TYPES OF HMI

A. The Pushbutton Replacer

Among the most common types of HMIs is the pushbutton replacer. Central control panel consist of multiple buttons and each perform a specific task or function. In many industries pushbutton is used to improved their efficiency and

productivity. They allow to the employee of their company to operate that machine by using various command with their interface.

B. The Data Handler

Another commonly used type of HMI is the data handler. This HMI is primarily used for gathering/harvesting data, at which point it may be sent a hard drive or printed out, depending on the user's command. Data handlers are particularly useful in applications involving large amounts of data.

C. The Overseer

A third type of HMI is the overseer, which is typically run on the Windows operating system. It takes a more visual approach to the interaction between a human operator and machine, allowing for a graphical interface via an electronic display or touch screen display.

While selecting a Human Machine Interface, first human think that how and where it will be going to used. When used in industrial settings, the pushbutton replacer is an excellent choice. It's simple, easy to use, and maintains a high level of reliability, which is particularly important in industrial settings.

III COMMON APPLICATIONS FOR HUMAN MACHINE INTERFACES

The human machine interface (HMI) is very popular in coming years and. Human machine interface mainly focus on industrial applications and uses. However, this doesn't necessarily mean that they aren't used for other purposes.

A. Automotive Dashboards

Several of the world's leading automakers are now adding HMIs into their vehicles. A typical in-car HMI may consist of a touch screen-enabled interface through which the driver or

passenger can control systems like the heating, air conditioning, turn-by-turn navigation, radio/stereo, and more.

B. Equipment/Machinery Monitoring

Human machine interface mainly involves in the monitoring of equipment or machinery and it is the common application for it. This is particularly common in factories and other industrial settings, as workers rely on HMIs to ensure their equipment is running properly. The HMI is connected to the respective equipment and/or machinery, sending it valuable data about its processes.

C. Electronic Displays

Of course, HMIs can also be used for electronic displays. An HMI, in its most basic form, is nothing more than an interface through which a human operator controls a machine. So, an HMI could essentially be a touch screen interface that is used to display e-ink text.

D. Building Automation

Home and building automation have become a hot topic as of late. It involves connecting multiple indoor systems together so they can be controlled from a single interface. Most of the systems used in building automation may include heating and air, humidity, lights, and security systems. HMIs are frequently used in building automation, as it streamlines the process while providing the owner with a convenient control interface.

E. Audio/Video Production

Human machine interface is having less application in audio/video production. Audio and video companies may use Human Machine Interface to control their microphones and video cameras.

IV FUTURE SCOPE OF HUMAN MACHINE INTERFACE (HMI)

The human machine interface is an innovation of the middle expansion

The human-machine interface is the middle of advancement and innovation as the influence of touch-screen technology used in smart phones and tablets is spilling into the design of industrial operator interfaces. Add more powerful microprocessors and connectivity options into the mix, and there are new possibilities and advanced functionality that is helping to fulfill the vision of the HMI as a portal for machine communications.

While there is still a need for value-based HMI options and smaller, less expensive screens, the trends are clear including bigger screens, more resolution and colors, and solutions for harsh industrial environments. But the biggest changes come back to the influence of touch technology and a fundamental change in the way's operator screens are designed.

V Advantages of Human Machine Interface

The advantages of Human Machine Interface are:

A. Improved Productivity

Human machine interface improves the efficiency of a machine that performed a task. If any person is performing any task, the software and system is more productivity. HMI is using in the industries that perform more work in lesser time.

B. Satisfaction/ Pursuit of Happiness

HMI have the ability to control any system or device effectively. The use of HMI in entertainment and relaxation is increase the comfortability the people of life. For example, on-line game can play by different locations.

C. Enhance Data Saving/Recording

HMI have high ability to recording the data. Type the command into the HMI, it is connected automatically to the device and record the data. All such data can be used later. For example, troubleshooting, future mechanical problems.

D. Internet of Things

Internet of things is a collection of devices which are connected to the internet. Human machine interface is a system which is also connected to the internet too. The remote-control access and monitoring the networking is also an application of internet.

E. Data_Translation

Human machine interface translates the industrial control system data into readable and visual representations by human. An operator is able to see the graphical representation

of the system and control them by using switching pumps on and off in the industrial plant.

F. Reduce the Cost of Hardware

Human machine interface is reducing the cost of industries like consoles, panels, cables etc. HMI is replacing the hundreds of saving cost on them.

VI DISADVANTAGES OF HUMAN MACHINE INTERFACE

There is no disadvantage in HMI. They are efficient and their defects are minimal. HMI is very useful and play an important role in current era. No issue regarding an interface is acquire.

A. Security

Human machine interface is a software system and have been considered to secure from any malware. Because of their connected ability to internet, they have high risk of hacking. Sometime a defective HMI gateway hacker cash the system and lots of important and confidential data is loss.

B. Poor Interface Design

Most accidents involving machine and automobiles are attributed to human error but when they are investigated in detail, it is often concluded that they were in fact caused by poor designing of an HMI thus causing problems of interaction between the machine and the operator. A poorly designed interface can result in undesirable operational consequences and errors that may have devastating impacts on safety and performance.

CONCLUSION

The Human-Machine Interface (HMI) provides an important visual of what is going on inside the control system. It is also an easy way to see multiple events in real time. It is mainly providing better safety to operator, increase productivity and create troubleshooting easier. There is a future scope in technologies like Robotics- sensors, smart phones, etc.

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