Human Machine Interface

Asst.Prof.S.Pange, Nikita Wadekar, Abhishek Jadhav, Akash Chavan

Asst.Professor , BE Student JSPM'S JSCOE, Hadapsar, Pune2

Electronics and Telecommunication Engineering Jayawantrao Sawant College of Engineering, Pune

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Abstract –

This document presents a comprehensive literature survey of recent advancements in Human-Machine Interaction (HMI), with a primary focus on cutting-edge technologies poised to significantly shape the future trajectory of this field. By providing insights into current technical achievements and prospective developments, it becomes evident that advanced HMI technologies are on the brink of convergence. This convergence entails the integration of functionalities across HMI devices, the establishment of novel sensor fusion methodologies, and an overarching goal of bridging the gap between intelligent machines and humans.

HMI holds pivotal importance in enabling the widespread adoption of robots and machines among populations lacking expertise in software and hardware. This is particularly transformative for segments such as the elderly and disabled, where intuitive interfaces facilitated by HMI facilitate enhanced accessibility and usability. As the field progresses, it is poised to revolutionize the way individuals interact with and benefit from intelligent machines, thereby fostering inclusivity and empowerment across diverse demographic groups.

*Key Words***:** HMI, sensor, robot and machines, software and hardware.

1.INTRODUCTION

A Human-Machine Interface (HMI) serves as a pivotal link between human operators and industrial machinery, enabling seamless interaction and control within complex processes. Unlike Graphical User Interfaces (GUIs), which are more general-purpose, HMIs are specifically tailored to industrial contexts, facilitating tasks such as data visualization, production monitoring, and performance tracking.

In industrial environments, HMIs play a crucial role in providing operators with real-time insights into key metrics and operational parameters. For instance, an HMI might empower a plant-floor operator to monitor and regulate the temperature of a water tank or oversee the status of various machinery components. Basic HMI implementations encompass a spectrum of devices, ranging from built-in machine screens to portable tablets, each serving the common objective of delivering actionable intelligence on mechanical performance and process advancement.

Modern HMI systems exhibit heightened versatility and accessibility, extending beyond traditional fixed displays to encompass a diverse array of platforms. These may include operator panels/interfaces with varying screen sizes, HMI software running on standard PCs, or even mobile devices with wireless capabilities, ensuring operators have continuous access to critical information. Moreover, the integration of HMIs with Programmable Logic Controllers (PLCs), drives, and network components facilitates comprehensive device management and process monitoring, further enhancing operational efficiency.

2.LITERATUR SURVEY

Title of paper	Author Name	Year	inference
Human-Machine Interaction Towards Industry	Jialu yang, Tianyuan liu, Ying liu, Phillip morgan	November 2022	Human-centric smart manufacturing (HCSM) is pivotal in Industry 5.0, with human-machine interaction (HMI) at its core. HMI's design orientation must align with the principles of Industry 5.0, emphasizing human-centric, sustainable, and resilient approaches.

| Title of paper	Author Name	Year	inference
Human-machine interface in smart factory: A systematic literature review	Naveen Kumar, Seul Chan Lee	January 2022	This study investigates the characteristics of HMIs in smart factories to provide deep insights into them. A systematic literature review on HMI using the PRISMA method was conducted. The results identified smart factory functions, tasks, information types, and HMI interaction types.
Human-Machine Interfaces and Vehicle Automation	Shashank Mehrotra, Meng Wang, Nicholas Wong, Jah'inaya Parker.		The purpose of the current study was (a) to review and synthesize existing research and guidance on HMI design regarding requests to intervene for driving automation systems

3. BLOCK DIAGRAM
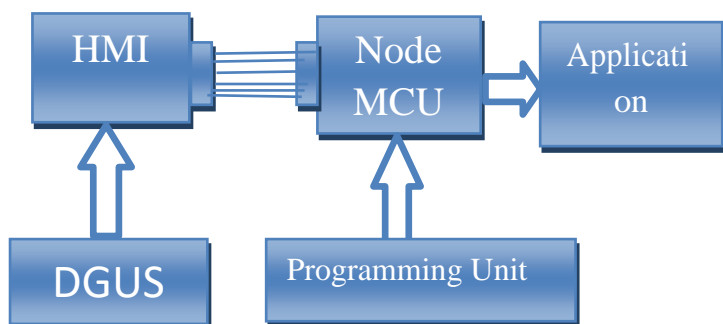
Fig. 3.1 Block Diagram

It consists of various block like HMI itself, embedded controller or Node MCU, DGUS software, the programmer Unit, application. These all blocks will entirely create system or the application We want to develop. Our main project will focus on HMI block. With the help Of DGUS software we going to design the required UI for proposed system

4. Methodology

The method in the back of the offered literature survey on recent advancements in Human-Machine Interaction (HMI) involves a systematic and comprehensive review of relevant instructional and enterprise guides. The following steps outline the technique hired in crafting this abstract**:**

Literature Search:

A thorough seek of academic databases, journals, convention complaints, and legit sources in the field of HMI changed into performed. This protected structures together with IEEE Xplore, ACM Digital Library, PubMed, and other relevant databases.

Inclusion and Exclusion Criteria:

Inclusion standards have been described to select studies, articles, and courses that focused on recent improvements in HMI technologies. Exclusion criteria were applied to clear out inappropriate or old statistics.

Selection of Key Themes:
Key themes and subjects related to current HMI technologies were identified throughout the literature assessment method. This involved categorizing papers based on their consciousness areas, including sensor fusion methodologies, integration of functionalities across HMI gadgets, and the overarching intention of bridging the space among machines and people.

Data Extraction and Synthesis:
Relevant data and facts from decided on literature had been extracted and synthesized to form a cohesive narrative. This system worried summarizing key findings, technical achievements, and prospective tendencies in the HMI discipline.

Analysis and Interpretation:
The gathered statistics turned into critically analyzed to become aware of tendencies, styles, and common threads throughout one-of-a-kind research. The abstract displays an interpretative synthesis of the literature, highlighting the contemporary nation of the sphere and its capability destiny guidelines.

Incorporation of Significance and Implications:

The summary goes beyond summarizing person research by emphasizing the pivotal significance of HMI in allowing the tremendous adoption of robots and machines. It also underscores the transformative impact of HMI on segments such as the elderly and disabled, emphasizing the improved accessibility and usefulness facilitated through intuitive interfaces.

Drafting and Revision:

The summary became crafted, revised, and subtle iteratively to ensure readability, coherence, and conciseness. Attention became given to keeping a logical float that courses the reader thru the key factors of recent improvements in HMI.

Incorporation of Inclusivity and Empowerment Themes:

The abstract become structured to highlight the broader societal effect of advanced HMI technology, emphasizing inclusivity and empowerment throughout diverse demographic companies. This includes connecting technical improvements with their potential tremendous implications for people missing know-how in software and hardware.

5. Result

This module supports various color combinations for pixels and utilizes the RS232 communication protocol. We can easily configure our HMI module with Node MCU. Although our HMI module lacks an on-chip RTC, we can work around this limitation by using the system clock. We have also explored the DGUS software, which aids in designing the user interface for our HMI. With this software, we can add components like RTC, slider, buttons, and switches to the interface. To upload the firmware to our module, we'll need to work with different file types such as .hmi and .tft. Our project seems to be focused on evaluating, selecting, and working with our HMI module for specific applications, and we've covered various aspects of its functionality and configuration. We also make a sample project to show how the interface will look like in TFT Screen. In this we are using Page/Image switching, slider data and keyboard input that will show the calculation and here we also add RTC (Real Time Clock) for giving the information about current date and time. As per user command they performed, and this project having total 9 images. In this various option are available such as Timer, counter, Text related option, etc.

Fig.5.1 Result

6. CONCLUSIONS

The pervasive adoption of HMIs represents a paradigm shift in industrial automation, heralding a new era of streamlined operations and enhanced decision-making capabilities. By bridging the gap between human operators and machinery, HMIs epitomize the synergy between technological innovation and operational excellence, driving continuous improvement across industrial ecosystems.

7. REFERENCES

1. A B Usakli, S Gurkan, F. A. G. V. and Babiloni, F. On the Use of Electrooculogram for Efficient Human Computer Interfaces, 2009

2. Loviscach, J. Two Finger Input with a Standard Touch Screen, 2007
3. T. Scott Saponas, Desney S. Tan, D. M. R. B. J. T. J. A. L. Enabling AlwaysAvailable Input with Muscle-Computer Interfaces UIST, 2009
4. Chun Sing Louis Tsui, Pei Jia, J. Q. G. H. H. and Yuan, K. EMG-based Hands-Free Wheelchair Control with EOG Attention Shift Detection, 2007
5. Carmel Armon, Karin Gardner Johnson, A. R. and Nowack, W. J., Polysomnography, www.emedicine.medscape.co