Integrated Development Environment for Human Machine Interface

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Abstract- Now *a day's automated product design is the prime demand of manufacturing industries. To provide Quality of service in design, Human Machine Interface is the finest option for automation. Human Machine Interface is the part of industrial automation which provides an interface between human and machine through wearable devices and computers. Human-machine interface is the sector in automation which has made the greatest progress in the last few years. This progress is due to increasingly sophisticated and user-friendly HMI applications. The quality of the operating interface design can be measured by the ease with which an operator can detect and understand an event and how efficiently he can respond. With the right choice of interface and its configuration, users can control processes with ever greater exactness and undertake diagnostics and preventive maintenance to increase productivity by reducing downtime.*

Index Terms *- Quality of service, Human Machine Interface, wearable devices, computers, user friendly.*

I. INTRODUCTION

The complexity of human–machine interaction (HMI) is rapidly growing in modern industrial, medical, and military systems. Human operators are often challenged by control of high-order systems or unstable systems near the limits of controllability. Human Machine Interface is the part of industrial automation which provides an interface between human and machine through wearable devices and computers. Provide a good interface between operator and machine. So there is a natural need for a mechanism through which the operator can configure and monitor the machine. A human machine interface (HMI) typically fulfills this need as in [1].

Mission of system is to meet the defined usability requirements for a specific HMI System. The Human Machine Interface is where people and technology meet. We all use HMI to monitor and control a wide range of electronic systems, such as our home thermostats, building elevators, bank kiosks, gas pumps, manufacturing operator panels, and data access terminals. Human Machine Interface (HMI) equipment provides a control and visualization interface between a human and a process, machine, application or appliance. HMIs allow us to control, monitor, diagnose and manage our applications. The Human Machine Interface is where people and technology meet. We all use HMIs to monitor and control a wide range of electronic systems, such as our home thermostats, building elevators, bank kiosks, gas pumps, manufacturing operator panels, and data access terminals. The Human Machine Interface is where people and technology meet. We all use HMIs to monitor and control a wide range of electronic systems, such as our home thermostats, building elevators, bank kiosks, gas pumps, manufacturing operator panels, and data access terminals. All of the new HMI product gives customers the flexibility to configure the various I/O requirements based on different applications. Human Machine Interface (HMI) Systems provide the controls by which a user operates a machine, system, or instrument. HMI provides you a broad range of operators and panels. HMI's main functionality is to monitor, supervise, and control processes. This could be used in a variety of industries such as food processing, sawmills, bottling, semiconductors, oil and gas, automotive, chemical, pharmaceutical, pulp and paper, transportation, utilities, an more. HMI software provides the process knowledge and control needed to perfect the products companies make and the processes they manage.[2]

II. SYSTEM IMPLEMENTATION

All of the new HMI product gives customers the flexibility to configure the various I/O requirements based on different applications. The configuration software will be divided in three layers. In the first level of configuration software i.e. User Interface admin will provide all information required to view and enter HMI information.

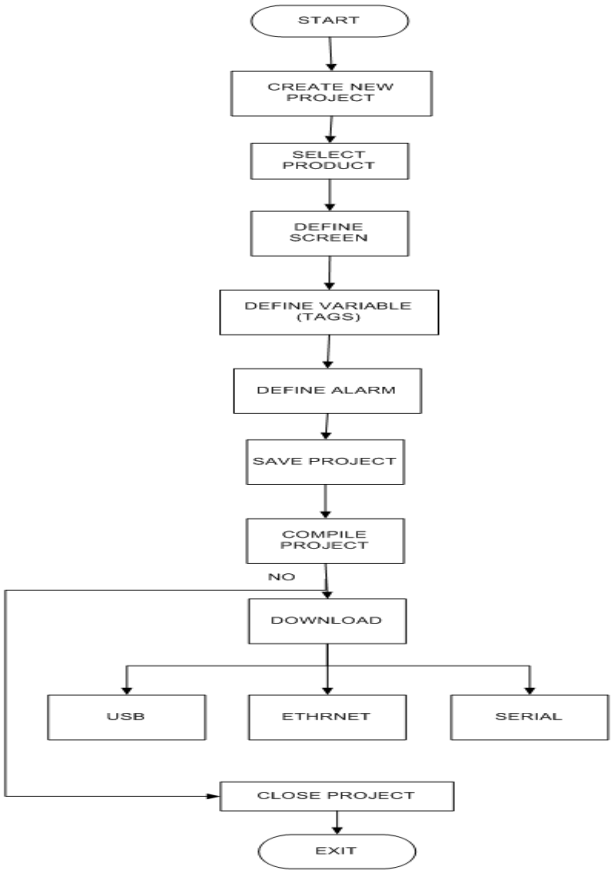

Fig 1. Flowchart of System

In this layer, depending upon user requirements admin will create new project and will select new product. Depending on HMI information admin will decide how much should be the screen size, what will be the variables required. Admin will set variables for alarm configuration and network configuration. Alarm configuration will contain setting of start time, end time, and fix time of plant. Network configuration will contain USB, Ethernet and Serial port variables and respective data. These all information will go to XML database format. After finishing of all these steps admin will save project and closed the project. If he wants to download project then he can download project through USB or Ethernet or Serial port.[5]

The HMI Data Engine exchanges tag values with the machine controller via a communication protocol supported by the controller. The typical machine control application involves hundreds of data variables or tags. Some of these tags are related to controller I/O and controller status, but the tag list also includes many internal tags for system state management, configuration, calibration, and so on. An HMI application organizes tag values and presents them to the operator by grouping related tags in a display page.[2]

The Tag Configuration Editor is a utility that developers use to create, configure, and maintain the application tag list. It exports a configuration file that the HMI can use to initialize the tag engine. These interfaces make it possible to set product parameters, obtain information on actuators, such as current consumption, temperature, speed, etc. You can use standard indicators to display analog, string, and digital tag values. Alarm displays, however, have behaviors that require additional software support. Common alarm displays include an alarm summary and alarm footer. The alarm summary typically is its own page, which an operator can view to see a complete list of alarms. Alarm footer is a one-line display that you can add to the bottom of any page to bring alarms to the operator's immediate attention. The Alarm Displays Engine provides the behavior for alarm displays. The operator can also choose the working language by setting it in advance.[4]

III. SYSTEM ARCHITECTURE

System architecture contains the basic functionality of the proposed system. Following diagram is the block diagram of a typical HMI architecture. It shows the relationship between several software components which would be installed on system.

1. Tags:

   This is the central database for the tags that need to be used in the application. Once the tags are defined and their attributes selected, the tags can be used in the application on screens, tasks, alarms etc. Select the type of tag from the Tag Type field. The Tag Name field is user definable. A tag is not added to the tag list unless a tag name is defined.[1]

2. Screens/Logic blocks:

   The basic function of displays in HMI applications is to provide an information source – operators interact to obtain information or to prompt for the next screen. The screen contains all the HMI pages for an application. The most common elements on a page front panel are navigation buttons, action buttons, numeric indicators, graphs, images, and Boolean controls and indicators.

3. Alarm:

   An alarm display is often just a special type of HMI page that displays the latest active and historical alarms.

4. Data Logging:

   Data logging is the measuring and recording of physical or electrical parameters over a

Period of time. The Data Logger can be used to record the values of tags over time. The data can be viewed using the Historical Trend Object. It can also be uploaded to a computer for analysis.

5. Communication:

Once we have established how HMI will look, feel, and operate, you need to consider how the HMI will connect to and communicate with the core equipment or system under control. Typically, communication can be achieved through several approaches: hard wired connection, serial bus connection, or wireless connection.

6. Language Configuration:

Supporting many alphabets, including English, France which makes it easy to add text in several languages to the labels in each object and change between the languages in runtime.

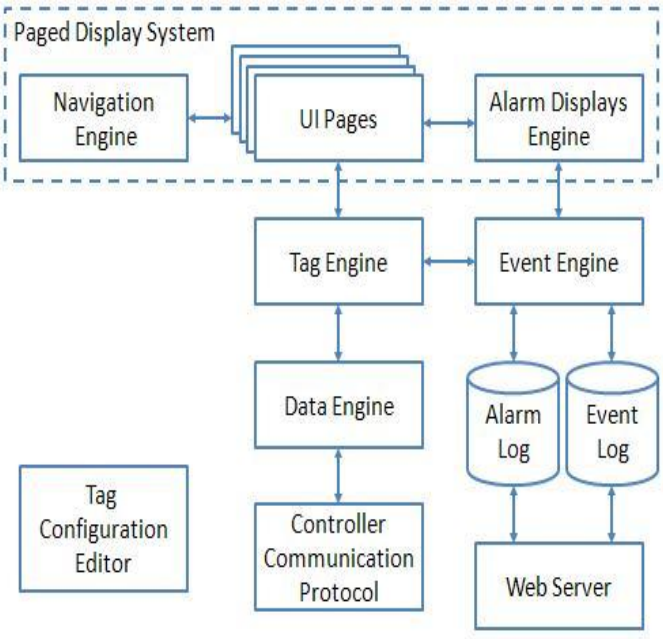

Fig 2. Architecture of the System

IV. METHODOLOGY

After comparison of various HMI systems and consideration of all HMI requirements following methodology are used to design good and user friendly HMI configuration.

1. **Contrast:** The things which are very different should look different.
2. **Repetition:** Repeat visual elements.
3. **Alignment:** Every element should have some visual connection with another.
4. **Proximity:** Things that belong together should be placed together; those that are different should not.[3]

V. CONCLUSION

HMI solutions are in a state of change, with industrial user interfaces taking inspiration from consumer products. The use of advanced 3D-style graphics and icon-based navigation and controls is generating user-friendly and intuitive user interfaces. Trend setting HMI solutions will support this mindset, with fully embedded state-of-the-art graphics providing well designed intuitive user interfaces, based on flexible widespread modern software technologies and true open platform architectures. Graphic user interfaces do not necessarily have to include the use of advanced graphic solutions. Simplicity and consistency often beats complexity and overly artistic solutions. However, the design process very often benefits from co-operation between graphic designers and application engineers. The designers of operator panels and industrial PCs are making their user interfaces more friendly and intuitive by taking inspiration from consumer devices such mobile phones. The designers of operator panels and industrial PCs are making their user interfaces more friendly and intuitive by taking inspiration from consumer devices such mobile phones. Digital technology offers the potential to enhance the human-machine interface and thus overall operator performance. Human factors and human-machine interfaces are well enough understood that they do not represent a major barrier to the use of digital I&C systems in any power plants [4]. There is a wide range in the type and magnitude of the digital upgrades that can be made to safety and safety-related systems. Displays are human-made artifacts should design to support the perception of relevant system variables and to facilitate further processing of that information. It is important for the magnitude of the human factors review and evaluation to be commensurate with the magnitude of the change. Any change, however, that affects what information the operator sees or the system's response to a control input must be empirically evaluated to ensure that the new design does not compromise human-system interaction effectiveness[5].

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