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Wireless Data Acquisition Node Development

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Abstract: This paper aims to develop a node which continuously monitors any machine and sends data to the server using Wi-Fi. This node will be installed to various machines at any given workplace. Node operates in form of array which means it has multiple replicas which monitor different machines at the same time. Various parameters of machine such as production count, oil temperature, motor vibrations, material supply and availability, state of machine are monitored and sent to the addressed servers for further analysis. Depending on data received various vital actions are taken to prevent any loss of time and money. This system is designed in such way that it is flexible so it could be installed on any machine with easy user interface for better operation, Hence it is better than any current system and improves overall operational excellence.

Keywords: Wireless node, ESP32, Wi-Fi, IOT

I. INTRODUCTION

Wireless data acquisition node is basically an electronic system which monitors any machine at any working environment. As currently this task is done manually by workers, many factors are neglected which results in major difference in overall production this system creates the perfect log which gives uncompromised and precise information. It has various sensors which sense all default parameters of machine and report to addressed servers if any change in values. The most important task of the system is to record on and off time of machine. By which we could track production graph without any issues. As this system is flexible so it can be used on any given environment.

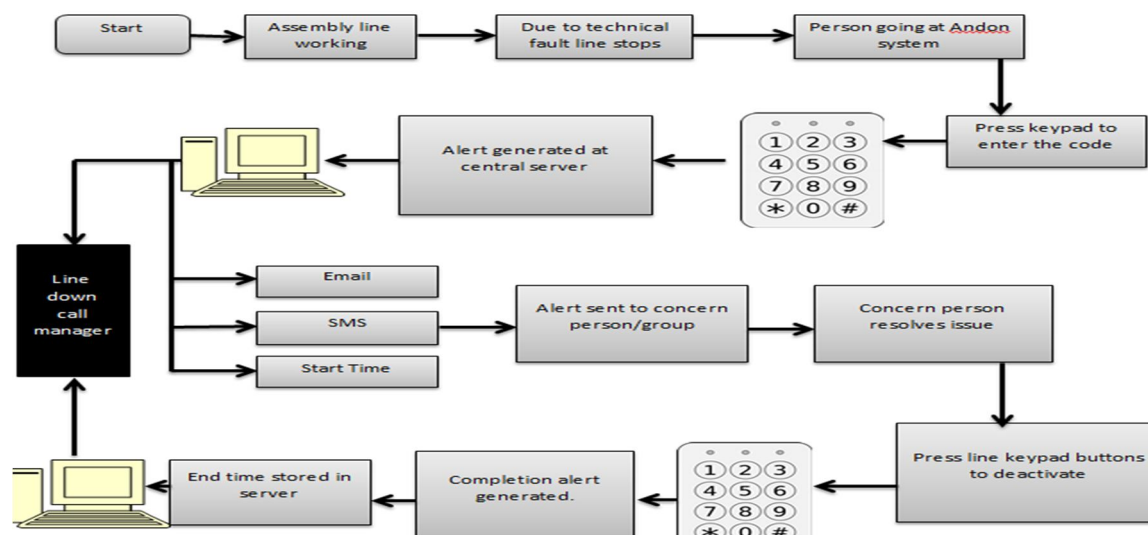
II. METHODOLOGY

The entire process is done in the way mentioned in this diagram, it basically explains a general assembly line and how it would react in any kind of error situation with this system on board.

On any assembly line if there is this system installed and there is any technical fault, the line stops and operator inserts the error code on the given keypad. For every error code there are different solutions, for example if there is no material for the production the error code generated will send the message to store room for the requirements.

This error is sent to central server which stores the entire log of that machine, log contains start time stop time and also the reason for its discontinuity. This log can be accessed by entering the server generated by the node.

Whenever there is any kind of issue with machine which in return disturbs the entire assembly line. In order to get proper solution on the problem there are various error codes for every different problems. This error codes are entered by the worker manually by the keypad provided on the node.



A. ESP32

The main processing unit used in this system is esp32 microcontroller. Its is arduino based chip which has multiple GPIO pins which are sufficient for implementation of all the components in this project. ESP32 is a 2.4 GHZ single core Wi-Fi and Bluetooth combo chip with 40nm technology. Following are some of the features of esp32.

B. Features

1) Wi-Fi key features:-

- a) 802.11 b/g/n
- b) 802.11 n
- c) WMM
- d) Defragmentation

2) CPU & memory

- a) 448 KB ROM
- b) 520 KB SRAM
- c) 16KB SRAM in RTC

3) Clocks & Timers

- a) External 32khz crystal oscillator for RTC with calibration.
- b) Two timer group
- c) One RTC time
- d) RTC watchdog
- e) Internal 8Mhz oscillator

4) MCU & Pins

- a) Number of cores 2
- b) Architecture 32bit
- c) CPU frequency 160MHZ
- d) Wi-Fi Yes
- e) Bluetooth Yes
- f) RAM 512KB
- g) Flash 16MB
- h) GPIO pins 36
- i) Busses SPI, I2C ,UART , I2S , CAN
- j) ADC pins 18
- k) DAC pins 2

C. Proposed work

System in this paper ensures both flexibility and reliability. Code used is optimal for application also requires less changes while change in fields. This kind of system is new for any kind of commercial application hence has easy UI to get work done. Data collected on servers can be viewed by different departments for evaluation and improvements in the process. Microcontroller used has all wireless properties required and also provide security of data.

D. Advantages

- 1) This system is IOT based hence has wide range of communication compatible.
- 2) It is more reliable, because error occurrence is rare.
- 3) It is more accurate and useful than current systems.
- 4) It has easy user interface.
- 5) It is flexible and can be used on any particular machine.

E. Disadvantages

- 1) It will add to the overall machine cost.
- 2) Installation procedure is complicated.

F. Applications

- 1) It is used to monitor an entire array of machines at any workplace, Or an assembly line.
- 2) It is used to collect data about all the machines and create the log individually.

III.CONCLUSIONS

The main aspect of any industry to improve production is operational excellence, which definitely improves with the help of this system. The prime objective is to ease the monitoring of any system is fulfilled. Also helps in improving the production at any given assembly line by data found. Finding of accurate reason in case of failure without any waste of time is done. It also changes the current scenario by making process more efficient and comparatively easy to manage which is a purpose of this project.

IV.ACKNOWLEDGMENT

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