An IOT based Online Motoring System for Textile Looms

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Abstract— Monitoring solutions using the Internet of Things (IOT) techniques, can continuously gather sensory data, such as rpm and breakage of waft and trap, and provide abundant information for a monitoring centre. Nevertheless, the heterogeneous and massive data bring significant challenges to real-time monitoring and decision making, particularly in time-sensitive industrial environments. This presents an online monitoring system based on an IOT system architecture which is composed of three layers: 1) Sensing 2) Network 3) Application layers. It integrates various data processing techniques including protocol conversion, data filtering, and data conversion. Results indicate that the proposed solution well addresses the challenge of heterogeneous data and multiple communication protocols in real-world industrial environments.

Key words: IoT, Textile Loom, Raspberry Pi-3, Weft, Warp, Length, Efficiency, Accumeter

I. Introduction

An Online monitoring system is essential to monitor environment conditions and working status of major equipment in industrial fields, so as to achieve accurate failure prediction, timely repair, and maintenance of the equipment. Such system contributes to the integration of operation, maintenance, and management of the equipment. Nevertheless, being limited by the severe conditions of industrial environment, most measuring methods are unreliable or too expensive to maintain. The demand for online monitoring and maintenance, repair, and overhaul (MRO) services has been constantly rising. The Internet of Things (IOT) provides a promising solution for online monitoring and related activities, along with wireless sensor networks (WSNs) and mobile Internet. IOT has developed from a convergence of technologies including wireless communication the Internet, and micro electromechanical systems. IOT has a close relationship with machine-to-machine (M2M) communication in smart manufacturing, since M2M provides a comprehensive solution with data acquisition, data transmission, data analytics, and service management. Technically speaking, a typical IOT system architecture is composed of four layers: 1) Sensing 2) Network 3) service layer 4) Application layers. The foundation of IOT is networks of massive sensors or mobile terminals that sense and gather data constantly. In IOT, WSN is in charge of gathering and transferring environment data. An IOT-based online monitoring system is composed of a large number of wireless sensor nodes.

II. Description of project

A. Problem with current textile loom Title

The present study is an attempt to analyse the functioning of the handloom & powerloom industry & assessing the problems suffered by the industry in maharahshtra in general. The study is expected to reveal the deficiencies if any, and enable to suggest appropriate measures for the Problems Faced by Handloom & Powerloom industries in Maharashtra, and thereby serve the interest of weavers, traders & consumers more effectively. The present study is integrated and comprehensive study on handloom & powerloom industries of Uttar Pradesh projecting its detailed picture. This may help to enlighten the pathways to action and give broad indication for different policy options. The present study is an attempt to discover the factors that accounts for its vitality, strength and weakness.

B. Arduino:

Fig. 1:

The Arduino Uno is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals. The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Arduino Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 microcontroller chip programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Arduino Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

This is the Arduino Uno R3. In addition to all the features of the previous board, the Uno now uses an ATmega16U2 instead of the 8U2 found on the Uno (or the FTDI found on previous generations). This allows for faster transfer rates and more memory. No drivers needed for Linux or Mac (inf file for Windows is needed and included in the Arduino IDE), and the ability to have the Uno show up as a keyboard, mouse, joystick, etc.

The Uno R3 also adds SDA and SCL pins next to the AREF. In addition, there are two new pins placed near the RESET pin. One is the IOREF that allow the shields to adapt to the voltage provided from the board. The other is a not connected and is reserved for future purposes. The Uno R3 works with all existing shields but can adapt to new shields which use these additional pins.

Microcontroller: ATmega328

- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

C. *Raspberry pi 3*

Fig. 2:

The Raspberry Pi Foundation has revealed its latest leap-forward, introducing a Wi-Fi-enabled Pi 3 computer with twice the performance of the previous generation

The Raspberry Pi 3 will cost the same as its predecessor, but feature much more powerful hardware. Bluetooth will be built into the board for the first time, and is powered by a Quad Core Broadcom BCM2837 64bit ARMv8 processor.

The Pi 3 runs at 1.2 GHz, compared to the Pi 2's 900MHz, and also has an upgraded power system, and the same four USB ports and extendable 'naked board' design as the Pi 2. "Four years ago today, we launched the first Raspberry Pi with our friends at Premier Farnel," Pi founder Eben Upton said.

So successful has the board been, it is now almost certainly the best-selling British-made and designed computer in history, Upton told the BBC. "Today we’re launching Raspberry Pi 3: it’s still $35 and it’s still the size of your credit card, but now it comes with on-board wireless LAN and Bluetooth, 50 percent more processing power, and a Quad Core 64bit processor. The new Raspberry Pi opens up even more possibilities for IOT and embedded projects.

- CPU: Quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz
- GPU: 400MHz Video Core IV multimedia
- Memory: 1GB LPDDR2-900 SDRAM (i.e. 900MHz)
- USB ports: 4
- Video outputs: HDMI, composite video (PAL and NTSC) via 3.5 mm jack
- Network: 10/100Mbps Ethernet and 802.11n Wireless LAN
- Peripherals: 17 GPIO plus specific functions, and HAT ID bus
- Bluetooth: 4.1
- Power source: 5 V via Micro USB or GPIO header
- Size: 85.60mm × 56.5mm
- Weight: 45g (1.6 Oz)

D. *Controller AT89S52*

Features

- Compatible with MCS-51® Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory – Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM • 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

E. *Working*

In Textile looms, machine stops working mainly because of 4 reasons i.e. WARP, WEFT breakage, accumeter and power. Whenever the machines stop working it give signal that machine is stop working and have different signals for different reasons. Using this signal we can record the timings of machine not working, reasons, calculate the efficiency. This signal is connected to 5V voltage regulator to step down the voltage level, this step downed signal is connected to LCD display which will display the signal type. This signal is also connected to the Pi via Arduino. Using pi we will count the number of times machine stops, separate counting of each signal and then this data is uploaded to online cloud using backendless server. Using backendless we can fetch the data to the android app from where we can monitor the current status and working efficiency.

1) Flow chart:

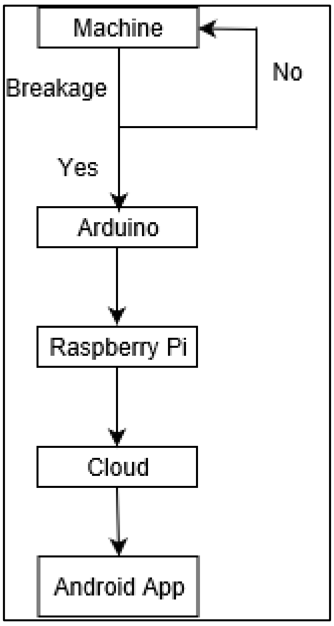

Fig. 3:

III. BLOCK DIAGRAM

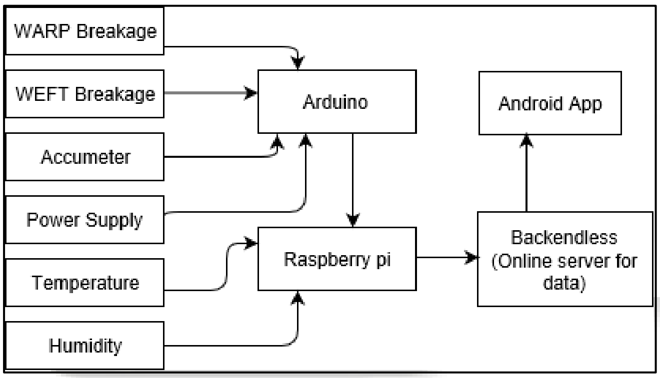

Fig. 4:

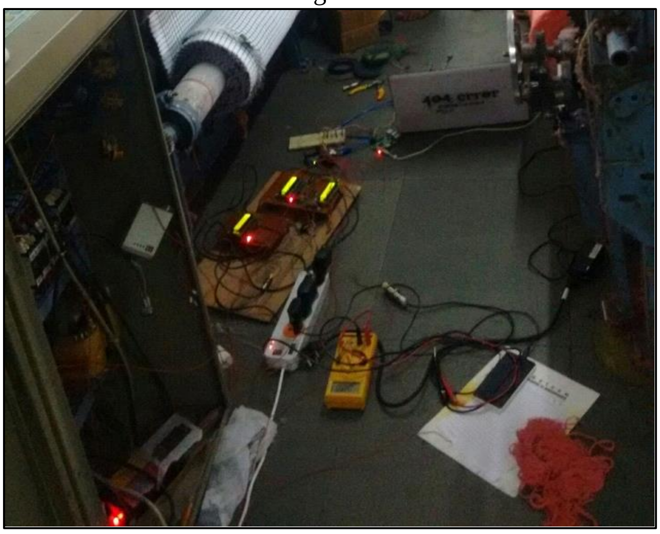

Fig. 5:

A. Output Table

HUM DOUBLE	TEMP DOUBLE	ACCU STRING | MAX LE...	PWR STRING | MAX LE...	WARP STRING | MAX LENGT...	WEFT STRING | MAX LE...
22	35	---	---	---	1
22	35	---	1	---	---
22	35	---	---	---	---
22	35	---	---	---	---
22	35	---	---	1	---
22	35	2	---	---	---
22	35	---	---	---	---
22	35	---	---	---	---
22	35	1	---	---	---

Fig. 6:

B. Application

- Textile loom
- Data analysis
- Online motoring
- Security system

The original purpose of this project is to automatically collect all data using IOT technology. Moreover, this technology can also be used for security purpose. By using IOT and android app, only few and authorized persons will be allowed access to the place. Such technologies are also used in factory to make sure that not every worker is allowed access to the restricted areas of the office. With the help of IOT technology only few individuals will be allowed to access using IOT and app.

IV. CONCLUSION

Online monitoring of weaving process provides following benefits-

- Quality parameters can be displayed over textile owner and textile person in the industry. This reduces technical manpower need in the industry.
- Data generated during failure of one sensor and introduction of new is stored for analysis.
- The exact reason of failure can be found with these observations.
- The IOT and sensor support allow weaving process to its maximum rate.
- The overall quality and rate of production is increased.

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