

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/351647221>

Automatic System to Calculate Working Hours for Machines and Operators

Conference Paper · February 2021

DOI: 10.1109/ICCCEEE49695.2021.9429572

CITATIONS

0

READS

883

1 author:



[Mohamed Abdelrahim](#)

Al-Neelain University

3 PUBLICATIONS 4 CITATIONS

SEE PROFILE

978-1-7281-9111-9/20/\$31.00 ©2020 IEEE

III. BLOCK DIAGRAM OF PROPOSED SYSTEM

The software starts recording the time to both machine and labor when the labor basing the ID card on RFID which is connecting to Arduino nano and sending the signal to a raspberry pi. Manager computer is connecting to raspberry pi throw WIFI. Software is converting the signal received from raspberry to digits for accounting hours to labor and machine. The Block diagram is shown below in Figure. 4 the steps.

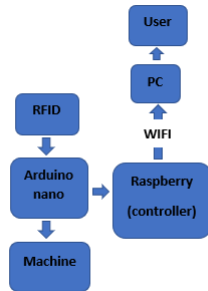


Figure (4): The Block diagram.

IV. FLOW CHART OF SYSTEM

When the power is supplied to the device system and the machine, it will not Work until passing the ID card. Arduino programmed to accept or denied the ID card. The flow diagram in figuer.5 below shown if the ID card is concerned with operating the machine. A signal from the device system will send to start the machine however If any ID card is not authorized to operate the machine the system will make an alarm and send a signal to the manager's computer for permission.

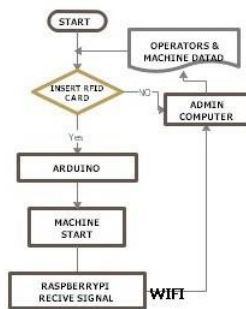


Figure (5): Flow Chart Of The System.

V. WORKING METHODOLOGY

1- Requirements of the project

The system consists from hardware and software :

1- hardware requirement:

- Relay.
- Power supply.
- Jumper Wires.
- Computer.
- WIFI.
- Buzzer alarm.
- Red and Green LED.
- LCD 16*2 .

2- software requirement:

- Debian software:

Debian GNU/Linux, is composed of free and open-supply software program, evolved with the aid of the community-supported Debian assignment, which was established by way of Ian Murdock on August 16, 1993[6]. For installation software we need memory card that is 16GB or more size into your laptop pr PC and format the memory card Extract the files contained in this Debian zip file. Insert the memory into raspberry and connect the power supply. Raspberry will now boot into Debian and should display.

-Python:

Python is an excessive-degree and well known-purpose programming language. Python's design philosophy emphasizes code clarity with its exquisite use of full- size whitespace. The figure.6 below showed the code written by the python program to programmed the pins on raspberry as inputs when its received the signal from Arduino.

```

File Edit Format Run Options Window Help
import RPi.GPIO as IO
import time
IO.setwarnings(False)
IO.setmode(IO.BCM)

IO.setup(2,IO.IN) #GPIO 2 -> Red LED as output
IO.setup(3,IO.IN) #GPIO 3 -> Green LED as output
IO.setup(14,IO.IN) #GPIO 14 -> IR sensor as input

while 1:

    if (IO.input(14)==True): #object is far away
        IO.output(2,True) #Red led ON
        IO.output(3,False) # Green led OFF
  
```

Figure (6): The python program.

- Arduino IDE:

The Arduino (IDE) is the number one textual content modifying software program used for Arduino programming. it is in which able typing up the code earlier than importing it to the board we need to software [7]. Arduino code is said as sketches. The Arduino board is connecting to a computer via USB, wherein it connects with the Arduino improvement (IDE). The figure.7 below showed the code written to programmed Arduino nano and RFID to accept or denied the ID card.

```

ARDUINO_UNO_RFID | Arduino 1.8.14 Hourly Build 2020/10/09 12:33
File Edit Sketch Tools Help

ARDUINO_UNO_RFID
MFRC522::MIFARE_Key key;

// Init array that will store new NUID
byte nuidPICC[4];

void setup() {
  Serial.begin(9600);
  SPI.begin(); // Init SPI bus
  rfid.PCD_Init(); // Init MFRC522

  for (byte i = 0; i < 6; i++) {
    key.keyByte[i] = 0xFF;
  }

  Serial.println(F("This code scan the MIFARE Classic NUID."));
  Serial.print(F("Using the following key:"));
  printHex(key.keyByte, MFRC522::MF_KEY_SIZE);
}

void loop() {
  
```

Figure (7): The Arduino (IDE).

-XAMPP web server:

It is a smooth-to-deploy package deal that bundles the Apache net server PHP, XDEBUG, and the MySQL database. this allows you to create the surroundings you want to run Joomla! in your nearby gadget [8]. We can reach the dashboard through localhost/dashboard/ to access SQL to create the database, figure.8 below shown the employers and their ID number in database.

Options	id	employee_id	date	time_in	status	time_out	num_hr
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	1	2018-04-27	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	14	1	2018-04-28	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	15	1	2018-05-04	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	16	1	2018-05-02	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	17	1	2018-05-01	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	18	1	2018-05-03	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	74	1	2018-04-30	08:00:00	1	16:44:23	7.7333333333333
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	75	3	2018-04-18	08:00:00	1	17:00:00	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	76	4	2018-04-19	08:00:00	1	17:00:00	8

Figure (8): The employers and ID number.

the figure .9 below shows the formula to calculate the overtime for the labor using my SQL .

Options	id	employee_id	hours	rate	date_overtime
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	6	240	1500	2031-11-08
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	4	283.33333333333	3600	2018-06-05

Figure (9): The formula of overtime .

2- Building the circuit:

- RFID card is programmed with the name and ID number of the operator and then connecting the RFID module to the Arduino as shown below in the figure .10.

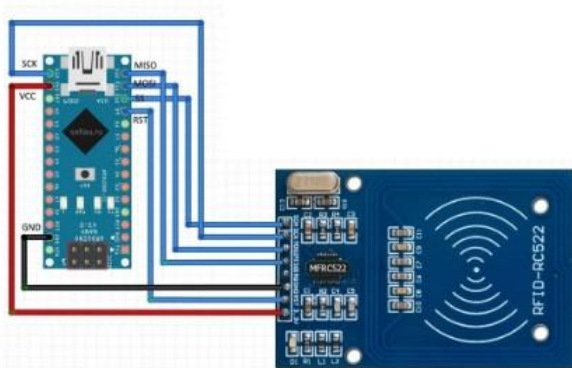


Figure (10): Connecting RFID To Arduino.

And also connecting relay module to Arduino and machine as shown below in the figure.11. All these components can program Before or after connecting.

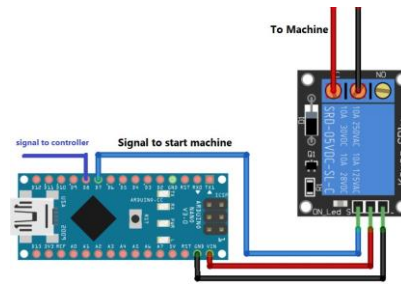


Figure (11): Connecting relay To Arduino and Machine.

- Connecting buzzer and LEDs to Arduino these component works when the authorized card is passed the green LED light and machine work if it's not authorized the buzzer and red LED well activated. Finally connecting Arduino to raspberry as shown below in the figure.12.

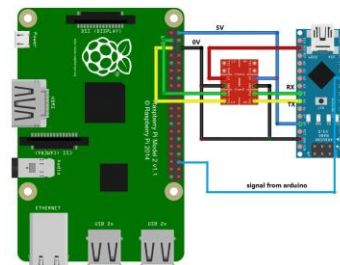


Figure (12): Connecting Arduino to Raspberry .

After the complete installation, all components install in one box this box had a connection point for the machine in the field as shown in figure.13 for the complete system by starting basing the card the machine start the software of admin computer starts calculating the hours. after work is done the operators passes the card again the machine well stops working then the program calculating the total number of hours per day there is a choice in Software to print the report and choose the period total of hours.

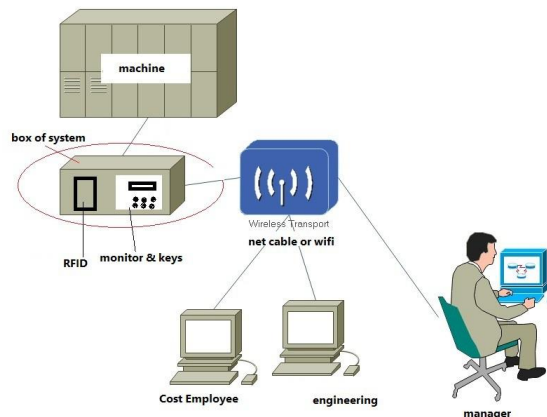


Figure (13): Connection point in Field.

VI. RESULTS

Below Figure.14 shown assembly of hardware inside box and test of Raspberry Pi, Arduino, and wife is connected, LEDs and buzzer as alarm, card RFID for access.



Figure (14): Device from Outside.

Below Figure.15 shown the system device connection in field using power bank as power supply to box, also connecting start key of CNC machine direct to box, finally using ID card of RFID to operating the machine.

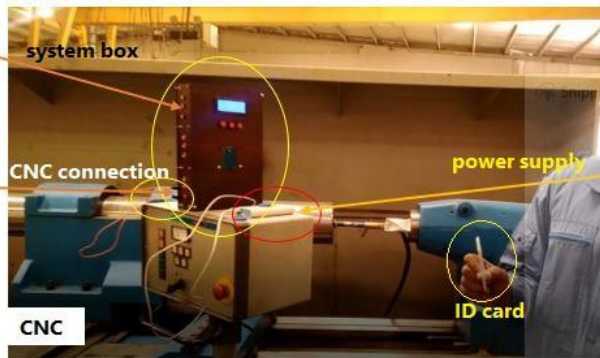


Figure (15): Connection in Field.

Figure.16 shown the red LED is light because the id card not authorized at the same time the signal sends it to system.

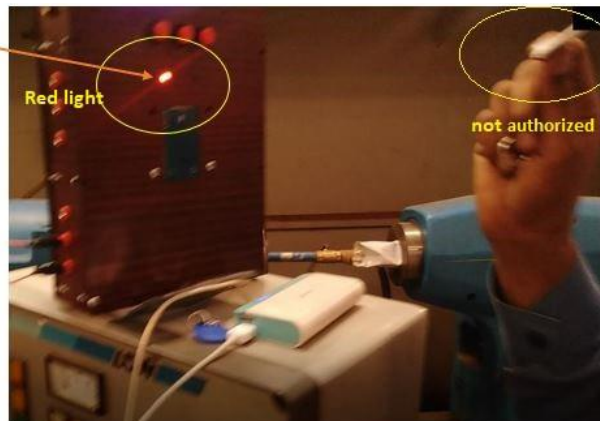


Figure (16): Red LED is Light.

Figure.17 shown the green LED is light, so machine it well starts

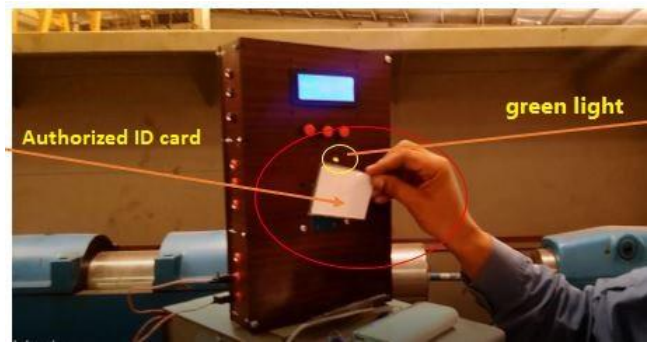


Figure (17): Green LED is Light.

Figure.18 shown the software in managers' computers consist of attendance of laborers and machine hours.

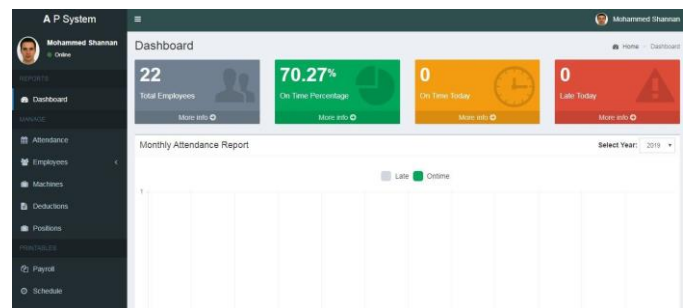


Figure (18): Software in managers' computers.

Figure.19 shown the report of attendance laborers and their time.

Date	Employee ID	Name	Time In	Time Out	Tools
Jul 12, 2018	LVD41238890	Lucas Cooper	11:56 PM	12:00 AM	Of Use
Jul 12, 2018	XRF342008719	Mason Beckett	11:54 PM	12:00 AM	Of Use
Jul 12, 2018	VFT157520346	Jack Adler	11:52 PM	12:00 AM	Of Use
Jul 12, 2018	ZTC714098032	Logan Paul	11:50 PM	12:00 AM	Of Use
Jul 12, 2018	BYP681749863	Mahmoud Abdou	11:46 PM	12:00 AM	Of Use
Jul 12, 2018	AE036154829	Khalid Hamad	01:57 PM	12:00 AM	Of Use

Figure (19): Attendance report.

Figure.20 below shown the report of one machine tested much time, the software calculated the hours very accurate.

Machine	Started	Stopped	Working Hours
GPIO17	2019-12-23 06:54:04	2019-12-23 06:54:35	0 Hours 0 Minutes
GPIO22	2019-12-23 07:06:52	2019-12-23 07:06:03	0 Hours 2 Minutes
GPIO27	2019-12-23 07:08:53	2019-12-23 07:15:28	0 Hours 7 Minutes
GPIO27	2019-12-23 20:16:10	2019-12-23 20:19:02	0 Hours 3 Minutes
GPIO27	2019-12-26 12:40:27	2019-12-26 12:43:44	0 Hours 3 Minutes
GPIO27	2019-12-26 12:54:05	2019-12-26 12:54:57	0 Hours 0 Minutes
GPIO27	2019-12-26 12:55:17	2019-12-26 12:55:28	0 Hours 0 Minutes
GPIO27	2019-12-26 12:56:23	2019-12-26 12:56:44	0 Hours 0 Minutes
GPIO27	2019-12-26 12:56:54	2019-12-26 12:57:36	0 Hours 1 Minutes
GPIO27	2020-01-06 08:09:45	2020-01-06 08:09:57	0 Hours 0 Minutes

Figure (20): Machines hour.

VII. CONCLUSION

This time of automation and also a time of great and urgent challenges, most of the world's countries focusing on the intelligent system to finish jobs very fast at a low cost but these systems are very expensive to some people. the system which is created can do the same things at a low cost for automation the job's beside easy installation. In the future, the system needs to add some option like key performance indicator to labor, profit, and salaries.

VIII. ACKNOWLEDGMENT

The author gratefully acknowledges to Alneelain University and GIAD Industrial Group

REFERENCES

- [1] I. Yule, "Calculating machinery operating costs," *Massey University, college of sciences*, 2000.
- [2] R. Enparantza, O. Revilla, A. Azkarate, and J. Zendoia, "A life cycle cost calculation and management system for machine tools," in *13th CIRP international conference on life cycle engineering*, vol. 2, 2006.
- [3] W. Harrington, "Learning raspbian," Birmingham, 2015, description based upon print version of record. [Online]. Available: <http://gbv.ebib.com/patron/FullRecord.aspx?p=1968966>
- [4] F. Perea, "Arduino essentials," Birmingham, 2015, description based upon print version of record. [Online]. Available: <http://gbv.ebib.com/patron/FullRecord.aspx?p=1968974>
- [5] S. Ahuja, P. Potti *et al.*, "An introduction to rfid technology." *Commun. Netw.*, 2010.
- [6] G. Garzarelli, R. Galoppini *et al.*, "Capability coordination in modular organization: Voluntary fs/oss production and the case of debian gnu/linux," *Industrial Organization*, vol. 312005, 2003.
- [7] S. Monk, *Programming Arduino next steps: going further with sketches*. McGraw-Hill Education, 2018.
- [8] P. Kumari and R. Nandal, "A research paper on website development optimization using xampp/php." *International Journal of Advanced Research in Computer Science*, 2017.