IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12537

"Collecting Machine Data Automatically For Digital Transformation"

Onkar Ravane[1], Junaid Pathan[2], Ajay Awalgave[3], Sushil Madewar[4],

Prof. Aditya R. Wankhade[5]

Student of APCOER[1], Student of APCOER[2], Student of APCOER[3] , Student Of APCOER[4], Assistant Professor APCOER[5],

Department Of Mechanical Engineering, Pune University, Anantrao Pawar College of Engineering and Research

Abstract: Digitalization in manufacturing means using computers and advanced technology to make factories smarter and more efficient. Instead of doing things the old-fashioned way, like using paper and manual labor, digitalization changes information into digital codes that machines can understand and work with. This helps things run faster and better.

When we digitize manufacturing, we stop relying on old methods and start working more closely with machines. This can make operations smoother and more efficient. Digitalization is like a big change in how factories work, bringing in new technologies like artificial intelligence, the Internet of Things (IoT), and robots.

This change will help factories adapt quickly to changes in the market and what customers want. By using things like sensors, parts that move, and a main control system, we can make machines work more precisely and automatically. This project aims to monitor machines in real time, control them from far away, and predict when they might need maintenance.

By connecting old-fashioned machines with new digital tools, this project hopes to make manufacturing better. It wants to make processes smoother, reduce the time machines are not working, and help factories become smarter places to work.

Keywords: Proximity Switch Sensor, Solenoid Electric Lock, Fingerprint Reader Sensor Module, Digital Temperature Controller.

1. INTRODUCTION

1.1 Proximity Switch Sensor NPN:

A proximity switch sensor NPN is a type of electronic switch that doesn't need physical contact to work. It works with a magnet and a special sensor. When the magnet gets close to the sensor, the sensor detects the change in the magnetic field and creates an electric signal. This signal is made stronger and turned into a signal that controls the switch.

1.1.1 Specificationof Proximity Switch Sensor NPN:

- Appearance: M12mm Cylinder
- DC Current: 40 mA
- Counting Range: 0 - 9999
- Detection Distance: 10mm
- Output Current: 200 mA
- Supply voltage: 8-24VDC,6-36VDC
- Switching Frequency: 320 KHz
- Output: NPN three wire normally open type

1.1.2The working of Proximity Switch Sensor NPN:

- An NPN proximity sensor works based on the principle of detecting changes in the electromagnetic field around it.
- Emitter and Receiver: The sensor consists of an emitter and a receiver. The emitter emits an electromagnetic field into its surroundings.
- Detection Zone: This electromagnetic field creates a detection zone around the sensor. When an object enters this zone, it disturbs the field.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12537

- Transistor Switch: Inside the sensor, there's an NPN transistor configured as a switch. In its normal state (no object detected), the transistor is "off," and there is no current flow between the collector and the emitter.
- Object Detection: When an object enters the detection zone, it interacts with the electromagnetic field, causing changes in the field's characteristics. This change is detected by the receiver in the sensor.
- Transistor Activation: The receiver signals the transistor to turn "on" when an object is detected. This causes current to flow between the collector and the emitter, indicating the presence of the object.
- Output Signal: The flow of current between the collector and the emitter serves as an output signal, which can be used to trigger other devices or systems, indicating the presence or absence of the detected object.
- An NPN proximity sensor detects objects by monitoring changes in the electromagnetic field around it. When an object enters the sensor's detection zone, it triggers the sensor to produce an output signal, indicating the object's presence.

1.2DC 12V Solenoid Electric Lock:

This DC 12V Cabinet Door Lock Electric Lock Assembly Solenoid is perfect for locking vending machines, storage shelves, file cabinets, and more. It's designed to be hidden, providing a backup unlocking method for emergencies.

1.2.1 Working OfDC 12V Solenoid Electric Lock:

When the power is on, the lock engages, securing the door. As soon as power is cut, the lock disengages, allowing the door to open. It's reliable, tough, and energy-efficient, with a long lifespan. Plus, its anti-theft and shockproof design make it superior to other locks.

Once the wires are connected and power is supplied, the electric lock can control the door's opening and closing.

1.2.2 Specification OfDC 12V Solenoid Electric Lock :

1. Iron Body Material
2. High quality ultra-compact electric lock.
3. Rustproof, durable, safe, convenient to use.
4. Suction tightly sucks the iron, thus locking the door.
5. Applicable for being installed in the escape door or fire door electronic controlled system.
6. Adopts the principle of electric magnetism, when the current through the silicon, the electromagnetic lock will achieve a strong.

1.2.3 Different Modes OfDC 12V Solenoid Electric Lock :

1.Power-On Unlocking Type: This mode unlocks the door only when the solenoid is powered on. Even if there's a power failure or the wires disconnect, the door remains locked, ensuring safety. It's ideal for places where security is a top priority.

2. Power-On Locking Type: In this mode, the door locks when the solenoid is powered on. If the power goes out, the door unlocks automatically. This feature is crucial for emergency exits during fire or accidents when quick evacuation is necessary.

3. Keeping Type: This mode allows for both locking and unlocking by sending a pulse voltage to the solenoid. It maintains the lock position even when power is off. This saves energy since the solenoid doesn't need to be powered continuously.

For safety, the lock is designed with two ratings: continuous and intermittent. The continuous rating allows for continuous power supply without overheating, while the intermittent rating is for short bursts of power without exceeding temperature limits.

1.3 AS608 Fingerprint Reader Sensor Module :

This is the AS608 Optical Fingerprint Sensor Fingerprint Module. It's a device that reads fingerprints.
Here's how it works: First, it looks at the unique features of a fingerprint and saves that information. Then, when someone wants to unlock something using their fingerprint, the module compares their fingerprint to the stored information.
There are two main steps:

1. **Fingerprint Registration**: This is when someone's fingerprint is saved in the module. The module takes two pictures of the fingerprint and saves them.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12537

2. **Fingerprint Matching**: When someone wants to unlock something, they place their finger on the sensor. The module compares their fingerprint to the saved ones. If it finds a match, it unlocks the thing. If there are multiple saved fingerprints, it looks for the best match. If it finds one, it unlocks. If not, it stays locked.
That's how the module decides if the fingerprint matches or not.

1.3.1 Specification of AS608 Fingerprint Reader Sensor Module :

- Resolution: 500dpi
- Supply current: <60mA
- Supply voltage: 3.3
- Fingerprint image entry time: <1.0 seconds
- Peak current: <60mA
- Window area(mm): 15.3×18.
- Communication Interface: USB/UART

1.3.2 Working OfAS608 Fingerprint Reader Sensor Module

Our hands have special patterns called friction ridges, which help us grip things. These patterns are unique to each person and are formed by the ridges and valleys in our skin. When we touch something, we leave behind fingerprints made of oil, moisture, dust, and dead skin cells.

Optical fingerprint scanners use a cool trick called Total Internal Reflection (TIR). They have a prism with a light on one side. When you put your finger on the scanner, some light bounces off your finger, while some travels along the prism's surface, making something called Evanescent Waves. These waves react differently with the ridges and valleys on your skin, causing something called Frustrated Total Internal Reflection (FTIR). The scanner takes a picture of this pattern, making it into a clear digital image.

This image becomes your fingerprint ID, saved in the scanner's memory as a template. The scanner can save multiple fingerprints, making sure each one is accurate by scanning twice. When you want to unlock something, the scanner compares your fingerprint to the stored templates. If it matches, you're in! If not, you're out. Matching against a specific ID is like checking a key to a lock (1:1 matching), while matching against all stored prints is like checking a bunch of keys to see which one fits (1: N matching).

1.4W3230 DC12V Digital Temperature Controller Microcomputer Thermostat Switch and Display:

This W3230 Digital Temperature Controller Microcomputer Thermostat Switch features an NTC 10K waterproof temperature sensor. When the temperature of the object reaches a certain set temperature at that time the microcomputer switches on the relay, in turn switching on the device connected to the output terminals.

1.4.1 Specifications OfW3230 DC12V Digital Temperature Controller Microcomputer Thermostat Switch and Display:

- Display Type: Digital
- Temperature sensor: NTC 10K
- Senor length:1.0m
- Temperature measuring range: -55 ° C ~ 120 ° C
- Resolution: 0.1 ° C
- Accuracy: ±0.1° C

1.4.2 Working Of W3230 DC12V Digital Temperature Controller Microcomputer Thermostat Switch and Display:

The DCI 2V Digital Temperature Controller Microcomputer Thermostat Switch is a device that helps control temperature using a tiny computer.

• Temperature Sensing: It has a sensor, usually a thermistor, that checks how hot or cold it is.
• Microcomputer Control: It uses a small computer to look at the temperature and decide what to do.
• Comparison and Decision Making: The computer compares the current temperature with what you want it to be. If it's too hot or cold, the computer decides if it needs to turn on a heater or a cooler.
• Output Control: Based on its decision, the computer turns on or off the heater or cooler.
• Feedback Loop: It keeps checking the temperature and adjusts the heater or cooler as needed to keep it just right.
• User Interface: There are buttons or a screen where you can tell it what temperature you want.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

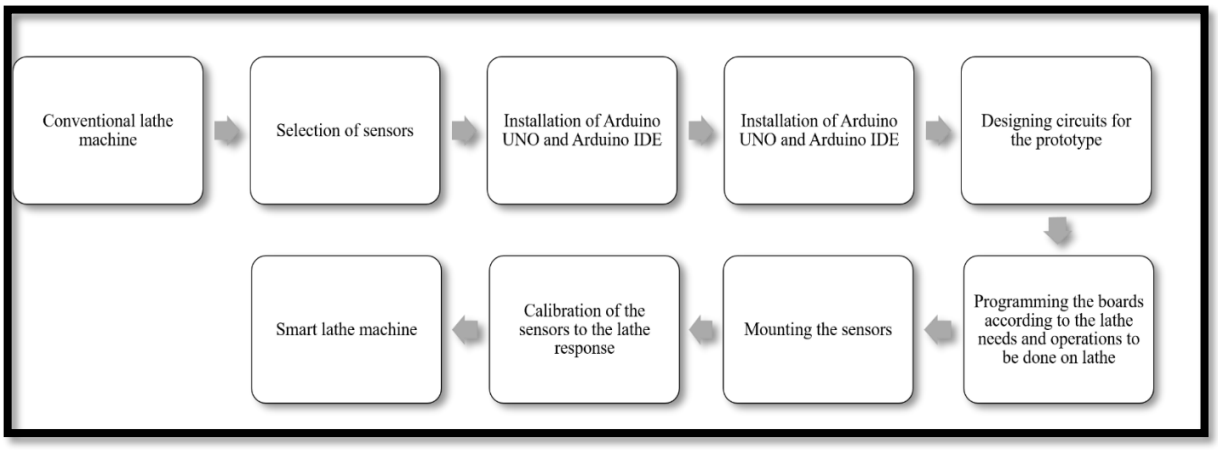
DOI: 10.17148/IJIREEICE.2024.12537

So, the DCI 2V Digital Temperature Controller Microcomputer Thermostat Switch helps keep the temperature how you want it by sensing temperature, using a small computer to decide what to do, and controlling heaters or coolers.

2. BILL OF MATERIAL:

Sr. No.	Item name	Quantity	Price/ unit	Amount
1	Arduino UNO R3 development board	2	Rs 720	Rs 1,440
2	Cable for Arduino UNO/MEGA (USB A to B)-30cm	1	Rs 44	Rs 44
3	16x2 LCD Blue with 12C Module	1	Rs 352	Rs 352
4	DC 12V Cabinet Door Lock Electric Lock Assembly Solenoid	1	Rs 586	Rs 586
5	DC12V Digital Temperature Controller Microcomputer Thermostat Switch	1	Rs 493	Rs 493
6	3.7V 2500mAh 18650 1S Lithium Battery Pack with BMS Protection	5	Rs 211	Rs 1,056
7	Display with Indicators Tachometer + Hall Proximity Switch Sensor NPN	1	Rs 1,469	Rs 1,469
8	1A Li-ion lithium Battery Charging Module with Current Protection - Type C	2	Rs 30	Rs 61
9	Black Plastic Storage Box Case Holder for Battery 2 x 18650 Cell Box, without cover	1	Rs 38	Rs 38
10	Black Plastic Storage Box Case Holder for Battery 4 x 18650 Cell Box, without Cover	1	Rs 67	Rs 67
11	14/38 Red Wire 12 Meters	1	Rs 120	Rs 120
12	14/38 black Wire 12 Meters	1	Rs 120	Rs 120
13	R Fingerprint Module 256 bytes	1	Rs 1,263	Rs 1,263
14	Heat Shrink Sleeve 5mm Black 5m Industrial Grade WOER (HST)	1	Rs 50	Rs 50

3. METHODOLOGY



4. Sensor selection:

As there are some key factors which play important role when working on a lathe machine. If these factors can be easily monitored it can help maintain optimum output generated from the machine. Moreover, if an inexperienced person is operating then it can be important referencing them as well as to the experienced worker.

Most commonly considered factors are spindle speed and tool temperature as they determine different factors of the job/product.

Sensors like proximity and temperature sensor can play a important role in it. Even to identify the person working on machine a finger sensor is used adding more security avoiding any failure or misshaping during a inexperienced persons operating. Allowing inly authorized people accessing the lathe.

1. **Solenoid Lock**
2. **Fingerprint sensor**

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12537

3. **Proximity Sensor**
4. **Temperature Module**

4.1 Test conducted:

1) Spindle speed (at pully speed 720 rpm without any load)

A) Withlow-speed gear combination

Sr.no	Gear type	RPM Denoted on machine chart	RPM measured by sensor
1	A	70	68
2	B	116	113
3	C	186	183
4	D	269	267

B) With high-speed gear combination

Sr. no	Gear type	RPM Denoted on machine chart	RPM measured by sensor
1	A	315	313
2	B	525	522
3	C	842	840
4	D	1214	1212

2) Temperature of tool surroundings

A) For mild steel tool

Sr. No	RPM range	Rangeof depth of Cut	Temperature range	Tool material
1	450 to 500	0.5mm to 2.5mm	55 C to 63 C	Mild steel
2	550 to 650	0.5mm to 2.5mm	65 C to 73 C	Mild steel
3	650 to 700	0.5mm to 2.5mm	78 C to 90 C	Mild steel
4	700 to 800	0.5mm to 2.5mm	93 C to 110 C	Mild steel

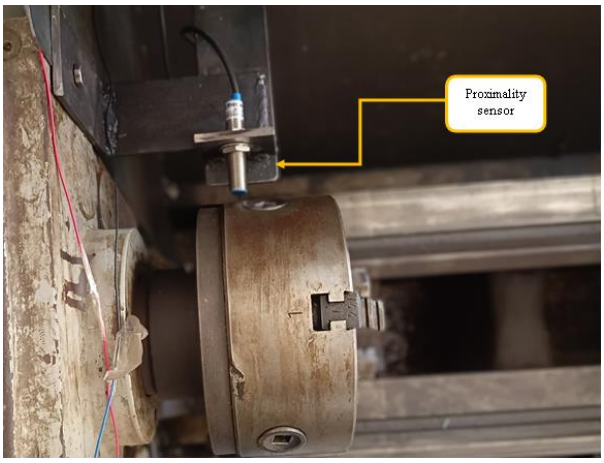
B) For cemented carbide tool

Sr. No	RPM range	Rangeof depth of Cut	Temperature range	Tool material
1	450 to 500	0.5mm to 2mm	38.2 C to 68 C	Cemented carbide
2	580 to 690	0.5mm to 2mm	49 C to 72 C	Cemented carbide
3	685 to 750	0.5mm to 2mm	42.8 C to 90 C	Cemented carbide

5. Integration of Sensor and Components on Lathe machine :

Integration of sensor is important step, after selection of sensors and needed components. Placement of each part/component was finalized as the dimensions of lathe.

1. **Proximity sensor:**



IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12537

Solenoid lock and Fingerprint Sensor

6. CONCLUSION

- Low labor costs and high-quality output are benefits of using a smart lathe machine.
- The smart lathe machine allows a machinist to control the temperature of the machine and turn it off while he is away.
- The current work is anticipated to be helpful for the manufacturing industry as well as the research community with regard to cost basis.
- Through a series of design changes and the use of a retrofitting technique, a conventional lathe machine can be converted into a smart lathe machine.
- By adding a few new features to the existing lathe, the newly created lathe's setup cost is increased; however, when compared to the fully automated/CNC machine, the setup cost is significantly lower.
- The repeatability and dimensional stability of the manufactured part are achieved due to the relatively high accuracy of the job manufactured in a semi-automated lathe.
- As we embark on the journey of Industry 4.0, CNC Lathe Machines emerge as indispensable assets in the realm of smart manufacturing.
- Their integration into modern production systems, coupled with commitment to excellence and innovation, facilitates efficiency, precision, flexibility, and data-driven decision-making, driving the evolution of manufacturing towards unprecedented levels of innovation and excellence.

REFERENCES

1.SMART LATHE MACHINE

Chigullapalli Rahul1, Polu Sankeerth2, Kalimera Uttej3, Kukkada Arun4, K.Raja sekhar5

1 2,3,4 Students, Mechanical department, Sreyas Institute of Engineering and Technology, Telangana, India.

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024
DOI: 10.17148/IJIREEICE.2024.12537

5 Associate Professor, Dept. of Mechanical Engineering, Sreyas Institute of Engineering and Technology

2.DESIGN AND CALIBRATION OF TORQUE MEASUREMENT SYSTEM OF COMPREHENSIVE PERFORMANCE TEST INSTRUMENT OF INDUSTRIAL ROBOT REDUCER

Zhen Yu1, Zurong Qiu2, Hao Li3, Jie Xue4, Wenchuan Hu5, and Chenglin Wang6
1,2,3,4 State Key Laboratory of Precision Measurement Technology and Instrument, Tianjin University, Tianjin 300072, China
5 Tianjin University of Technology and Education, Tianjin 300350, China
6 College of Mechanical Engineering, Tianjin University of Technology, Tianjin 300384, China

3 CONTACT-LESS TACHOMETER

Cariappa P K[1], Shwetha A[2], Pooja D[3], Sudharani B T[4], Geetha M N[5]
[1,2,3,4,5] Dept. of Electronics and Communication, Vidya Vikas Institute of Engineering and Technology Mysuru, India

4.FACE RECOGNITION BASED ATTENDANCE SYSTEM

Dhanush Gowda H.L [1], K Vishal[2], Keertiraj B. R[3], Neha Kumari Dubey[4], Pooja M. R.[5]
[1,2,3,4] Department of Computer Science and Engineering
[5] Associate Professor, Department Science and Engineering Vidyavardhaka College of Engineering, Mysuru, Karnataka, India

5. A STUDY ON FINGERPRINT SENSORS

G. ArunalathaAssistant Professor,
PerunthalaivarKamarajar Institute of Engineering and Technology (PKIET), Karaikal. (Puducherry)

6.DEVELOPMENT OF A SPECIALIZED LATHE CHUCK FOR TURNING OPERATIONS OF CAST IRON ROPE WHEELS

Izabela Miturska[1], Anna Rudawska[1], Nadežda Čuboňová[2], Nataša Náprstková[3]
[1]Lublin University of Technology, Faculty of Mechanical Engineering, Nadbystrzycka 36, 20-618 Lublin, PL. [2]University of Žilina, Faculty of Mechanical Engineering, Department of Automation and Production Systems, Univerzitna 8215/1, 010 26 Žilina, Slovakia
dynamic approach to bumper design addresses both safety and practicality concerns in automotive engineering, offering a versatile solution for collision mitigation while maintaining user convenience and vehicle appearance. [3]Jan Evangelista Purkyně University in Ústí nad Labem, Faculty of Mechanical Engineering, Pasteurova 7, 400 96 Ústí nad Labem, Czech Republic,

7.SOLUTIONS FOR TORQUE AND SPEED MEASUREMENT ON ELECTRIC MACHINE CONTROLLERS TEST BENCHES

A. VeyratDurbex[1], Y. Nachajon Schwartz [2], H. Tacca [3]
[1, 2] Traction and Power Drive Control Laboratory (LABCATYP), Department of Electronics, Faculty of Engineering, University of Buenos Aires, Paseo Colón 850, C1063ACV, Buenos Aires, Argentina
[3] Department of Energy, Faculty of Engineering, University of Buenos Aires Paseo Colón 850, C1063ACV, Buenos Aires, Argentina.

8.Development of Semi-Automatic Lathe by using Intelligent Soft Computing Technique

S Sakthi [1], J Niresh [2], K Vignesh [3], G Anand Raj [4]
[1,2,3,4] Department of Automobile Engineering, PSG College of Technology, India.

9.Thermocouple and Infrared Sensor-Based Measurement of Temperature Distribution in Metal Cutting

Abdil Kus [1], Yahya Isik [1], M. Cemal Cakir [2], Salih Coşkun [1] and Kadir Özdemir[2],
[1] Vocational School of Technical Science, Uludag University, 16059 Bursa, Turkey
[2] Department of Mechanical Engineering, Uludag University, 16059 Bursa, Turkey;

10.Spindle speed variation in turning: technological effectiveness and applicability to real industrial cases

P. Albertelli & S. Musletti& M. Leonesio & G. Bianchi & M. Monno