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FABRICATION OF ORDERS BY SCARA ROBOT WITH RFID TECHNOLOGY

A. CHANDRA MOULI[1], K.S.R. RAJA RAO[2], A. PRIYANKA[3], G. PRAVALIKA[4], B. RAJU[5], CH. LOHIT SIVA RAMA KRISHNA[6]

[1]A. CHANDRA MOULI, ME & UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

[2]K.S.R. RAJA RAO, ME & UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

[3]A. PRIYANKA, ME & UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

[4]G. PRAVALIKA, ME & UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

[5]B. RAJU, ME& UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

[6]CH.LOHIT SIVA RAMA KRISHNA, ME & UNIVERSITY COLLEGE OF ENGINEERING, JNTUK

Abstract - In today's world of automation, recognizing and processing parcels in a particular area of zone is a crucial task. One such task is pick-and place operation, which is well-known for its challenges. The main theme of this operation is to sort products into different areas based on their representative fields. To address this issue, we have a SCARA robot that is known for its liner momentum motion of 4 degrees of freedom. This robot is well-suited for pick-and-place operations and can perform operations in two axes. Moreover, it is cost-effective and efficient. The SCARA robot is connected to the Arduino Mega, which is run by servo motors and controllers. The fabrication of an Arduino based Parcel diverter system involves the creation of a system that uses an Arduino Mega microcontroller to sort and divert parcels based on their destination. The system is designed to take input from Radio frequency identification device that detects the parcels and direct them to their appropriate destination using a series of mechanical diverters. The fabrication process includes the design and assembly of the mechanical components, the programming of the micro controller, and the integration of the sensors. The resulting system provides a reliable and efficient way to sort and direct parcels in a variety of industrial and logistical applications.

***Key Words*:** Conveyor, Arduino Mega, IR/Thermal sensors, stepper motor, micro step driver SCARA robot, RFID system, DC Vacuum pump and DC Motor.

1. INTRODUCTION

A SCARA robot is a robotic arm with several joints that give it the flexibility to perform various tasks. It is one of the most popular and user–friendly robots used in the manufacturing industry for its accuracy and speed across various jobs. SCARA stands for selective compliance Articulated Robot Arm. These versatile machines are designed to mimic the movements of a human arm but operate with unwavering precision and efficiency. This robot includes a controller, a power supply, an end – effector (like a gripper), and specialized software. SCARA robots stand out from other industrial robots due to their unique range of motion, particularly in the X-Y Plane. This means it can move horizontally in any direction within its workspace. It can also move vertically, although with some limitations, as the vertical axis remains fixed. SCARA robots excel in just about any task, but their capabilities shine through in material handling operations. Whether they're picking up and placing objects, transporting items, or conducting assembly work, SCARA robots deliver the best performance. In the context of sorting packaging in different locations, a SCARA robot can be programmed to pick and place packages with great speed and precision. By integrating a programmable logic controller (PKC)/ARDUINO MEGA CONTROLLER into the system, a cost – effective and versatile solution for automated sorting tasks can be developed

2. LITERATIRE REVIEW:

Dr. Mnukid Parnichkun et al. (2014) as "Design and controled 3 axis pick and place SCARA robots ". journal will include the thesis for the development of a 3 degree of freedom SCARA robot.

Kaushik Phasale et al. (2018) as "Design, Manufacturing and analysis of robotic arm with SCARA Configuration ". This paper discusses about above line, aimed at developing a low-cost, versatile arm for pick and place operations. Controlled using servo drives and Arduino microcontrollers, the arm has 4 DOF and is controlled via an Android app with Bluetooth.

3. PROPOSED SYSTEM:

An Arduino Mega parcel diverter system is a type of automation system that uses an Arduino Mega microcontroller to control the movement of a mechanical arm that can divert parcels or packages to different destinations based on their destination codes. The system typically includes a conveyor belt that transports the packages towards the diverter system. Ass the packages approach the diverter, a sensor detects the package's destination code and sends and controls. Based on destination code, Arduino Mega microcontroller sends a signal to a motor that controls the mechanical arm then moves to divert the package to the appropriate destination chute or conveyor belt. The Arduino Mega parcel diverter system can be programmed to handle different types of packages with different destination codes. The system can also be integrated with other automation systems, such as barcode scanners and label printers, to optimize package handling and sorting. A diverted system using Arduino Mega can be designed to control the flow of materials in a manufacturing process or ang other application where it is necessary to switch the flow from one location to another.

4.HARDWARE DEVELOPMENT:

The core hardware components include:

CONVEYOR:

A conveyor belt works by using two motorized pulleys using two sensors. It is used to transfer the work object from one end to another.

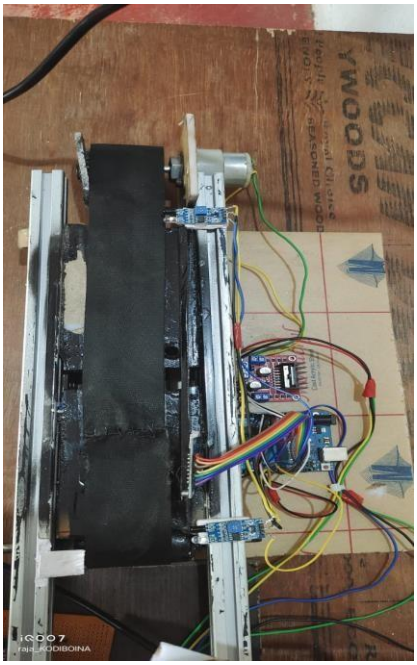

Fig: belt drive

ARDUINO MEGA:

It is a powerful microcontroller board used in DIY projects, robotics and automation systems. I. The board accommodates the ATmega2560 micrometer, which operates at a frequency of 16 MHz It has higher processing power, which can help work with number of sensors at a time

- It is simpler and more suitable for more complex projects.
- Controlled by the ATmega2560 microcontroller
- Provides 54 digital pins and 16 analog pins
- Ideal for advanced projects requiring numerous inputs/outputs.

DC VACUUM PUMP AND MOTOR:

Pump, here the medium is air, and this sucks the pressure, that would be known as suction process later, the air pressure used for the operating the system pumping has a unique role & accomplishes with the better features

DC motor, which is converts the electrical energy into mechanical energy, its working on the Flemming's left-hand rule

ARDUINO UNO:

Arduino uno is aa open-source microcontroller board. Boards can read inputs the signals through sensors

STEPPER MOTOR:

A stepper motor is a specialized electromechanical device that moves in precise, incremental steps, offering accurate control over rotation. In our project, the stepper motor plays a pivotal role in the motion-controlled water deployment system. Its ability to precisely control the opening and closing of values or other mechanical components ensures the targeted and efficient release of water in response to detected fires. This precise control enhances the overall effectiveness and responsiveness of our fire suppression system, making the stepper motor a key contributor to the project's success.

RFID SYSTEM:

It possesses these parts;

1) Frequency tag and reader

3) computer database

The RFID tag is read by reader and stores the data and transmits to the computer data base .

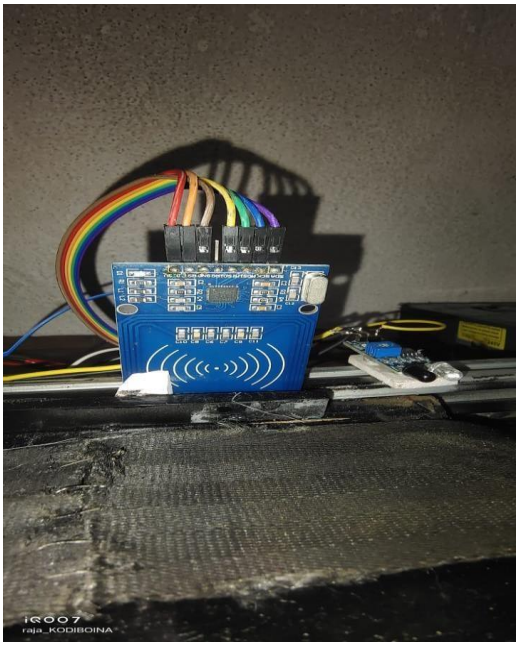

Fig: Reader

place. Whereas the objects with no RFID tags are also not segregated by the SCARA robot

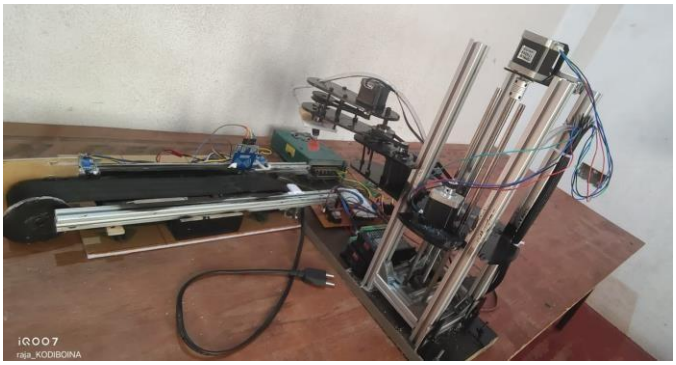

Fig: SCARA Robot

5.WORKING:

When power is supplied to SMPS, it makes the voltage stepdown to 5-7 volts and supplied to the Arduino Mega and later to the Arduino UNO. The objects on the conveyor are attached with the RFID tags and released on the conveyor. it carries the object or an order (parcel) on the belt starts moving. When the product passes through the RFID reader, it scans RFID tag, and the respective data is read and sends the output to the Arduino uno. This Arduino UNO takes the output and sends it to Arduino mega and that Arduino mega sends the output of UNO as the input for the SCARA robot. Initially the arm of the SCARA is in negative position, so when the input comes from the Arduino mega, the arm automatically moves towards the zero position. So that, the vacuum gripper position will be exactly perpendicular to the end of the conveyor. Therefore, the object on end of the conveyor will be picked up easily.

When the SCARA arm moves towards zero position, its starts moving downwards and the

electrical software components to achieve seamless coordination and control, ultimately gripper, with help of the DC vacuum pump it picks the object by the suction force of 70 N/m^2 After picking of the object, the arm starts moving upwards for some distance, (this is given by programming for our requirement based). Later the SCARA arm moves either to left or right, based on the information that is scanned by the RFID. Hence the objects are segregated in this way with no human intervention. This process continues until there are no objects that must be segregated on the conveyor. if there are no objects on the conveyor, the segregation does not take

RESULT:

The simple design of SCARA robot with RFID technology helps to minimize the human effect , increse the efficiency of work usage of high power system deals with the high speed of work , very easy to program also into the SCARA robot, this can be invovled in the packing transportation and some more indurtrial appilactions

FUTRUE SCOPE:

This would be used as mini robot arm with high power system, it increases the production rates, currently it is used in logistic companies like amazon, Flipkart, DTDC etc. If the implementation of SCARA robot with RFID technology spreads throughout the world, then the segregation of product in every industry might be easy

6. CONCLUSIONS

The main objective of our project is to create an efficient and cost-effective pick and place scara robot with four degrees of freedom (4-DOF) controlled by an Arduino based diverting system. Which is capable of carrying things and products in industries. The robot should be capable of precise and efficient pick and place operations, specified workspace. The project will involve the integration of mechanical electrical software components to achieve seamless coordination and

control, ultimately showcasing the capabilities of the SCARA robot in automation.

This project is done by using the methodology of SCARA robot, where the SCARA robot components are manufactured using a 3D printing machine, and after assembly, the robot is prepared. The servo motor and Arduino board are seamlessly connected to the SCARA robot. Additionally, a conveyor is integrated into the system, with power supplied to the servo motor. To enable efficient object diversion, RFID is installed, showcasing the capabilities of the SCARA robot in effectively managing objects on the conveyor through RFID technology

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