Cartesian Robot With Scanner Interface

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Abstract- *A Cartesian arrange robot is a mechanical robot whose three standard of hub of control are straight for example they move in straight line instead of pivot and are at right edge to one another. The three sliding joint compare to moving the wrist up-down, in-out ,back-forward .among different focal points this mechanical course of action rearranges the robot control arm arrangement. Cartesian arrange robots with the level part support at the two closures are now and again called gantry robots. Achievement of working envelop of Cartesian configuration is a rectangular prism. The robot can manipulate its maximum payload throughout the working volume. This leads to high degree of accuracy and repeatability due to their structure. Barcode scanning system are attached near gripper helps to scan barcode placed in cotton bar. This shares information of different component model and quantity etc. inside a cotton box scanner interface is a combination of hardware and software that allow to communicate with computer.*

I. INTRODUCTION

Cartesian coordinate robots with the horizontal member supported at both ends are sometimes called Gantry robots; mechanically, they resemble gantry cranes, although the latter are not generally robots. Gantry robots are often quite large

A popular application for this type of robot is a computer numerical control machine and 3D printing. The simplest application is used in milling and drawing machines where a pen or router translates across an x-y plane while a tool is raised and lowered onto a surface to create a precise design. Pick and place machines and plotters are also based on the principal of the cartesian coordinate robot.

Industrial gantry type cartesian robot is applied on CNC lathes production line for continuous parts loading and unloading. It performs 3-axis (X, Y, and Z) linear movement in high speed performance to save numbers of operators. In addition, the robot is able to handle heavy loads of pick and place parts feeding procedure with high positioning accuracy. Some special requirements might be low noise and customized supply table, which is made according to number of storage. Since handling is usually above the CNC, overhead gantry is also a common term to describe this type of robotic arm. Overhead design is suitable for most automation system.

A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand.

Typical applications of robots include welding, painting, assembly, disassembly pick and place for printed circuit boards, packaging and labeling, palletizing, product inspection, and testing; all accomplished with high endurance, speed, and precision. They can assist in material handling.

II. LITERATURE REVIEW

1 Object detection and recognition for a pick and place robot

Rahul Kumar, Sunil Lal Asia-Pacific World Congress on Computer Science and Engineering (2014)

Controlling a Robotic arm for applications such as object sorting with the use of vision sensors would need a robust image processing algorithm to recognize and detect the target object. This paper is directed towards the development of the image processing algorithm which is a pre-requisite for the full operation of a pick and place Robotic arm intended for object sorting. Next, the extracted image (parameters in compliance with the classifier) is sent to the classifier to recognize what object it is and once this is finalized, the output would be the type of the object along with it's coordinates to be ready.

2.Trajectory planning for flexible Cartesian robot manipulator by using artificial neural network: numerical simulation and experimental verification

Akira Abe Robotica 29 (5), 797-804, (2011) This paper presents a novel trajectory planning method for a flexible Cartesian robot manipulator in a point-to-point motion. In order to obtain an exact mathematical model, the parameters of the equation of motion are determined from an identification experiment. An artificial neural network is employed to generate the desired base position, and then, a particle swarm optimization technique is used as the learning algorithm, in which the sum of the displacements of the manipulator is chosen as the objective function. We show that the residual vibrations of the manipulator can be suppressed by minimizing the displacement of the manipulator. The effectiveness and validity of the proposed method are demonstrated by comparing the simulation and experimental results.

3.A method for reducing the energy consumption of pick-and-place industrial robots

Marcello Pellicciari, Giovanni Berslli, Francesco Leali, Alberto Vergnano Mechatronics 23 (3), 326-334,(2013) The interest in novel methods and tools for optimizing the energy consumptin in robotic systems is currently increasing. From an industrial point of view, it is desirable to develop energy saving strategies also applicable to established manufacturing systems with no need for either hardware substitution orfurther investments. Within this scenario, the present paper reports a method for reducing the total energy consumption of pick-and-place manipulators for given TCP position profiles.

III. DESIGN AND FABRICATION OF CARTESIAN ROBOT WITH SCANNER INTERFACE

3.1 DESIGN

Repeatability should be measured at maximum speed and at maximum payload. But this results in pessimistic values whereas the robot could be much more accurate and repeatable at light loads and speeds. Repeatability in an industrial process is also subject to the accuracy of the end effector, for example a gripper, and even to the design of the 'fingers' that match the gripper to the object being grasped. For example, if a robot picks a screw by its head, the screw could be at a random angle. A subsequent attempt to insert the screw into a hole could easily fail. These and similar scenarios can be improved with 'lead-ins' e.g. by making the entrance to the hole tapered.

3.2 TEACH PENDANT

Robot positions can be taught via a teach pendant. This is a handheld control and programming unit. The common features of such units are the ability to manually send the robot to a desired position, or "inch" or "jog" to adjust a position. They also have a means to change the speed since a low speed is usually required for careful positioning, or while test-running through a new or modified routine. A large emergency stop button is usually included as well.

Typically once the robot has been programmed there is no more use for the teach pendant. All teach pendants are equipped with a 3-position dead man switch. In the manual mode, it allows the robot to move only when it is in the middle position (partially pressed). If it is fully pressed in or completely released, the robot stops. This principle of operation allows natural reflexes to be used to increase safety.

3.3 LEAD-BY-THE-NOSE

This is a technique offered by many robot manufacturers. In this method, one user holds the robot's manipulator, while another person enters a command which de-energizes the robot causing it to go into limp. The user then moves the robot by hand to the required positions and/or along a required path while the software logs these positions into memory. The program can later run the robot to these positions or along the taught path. This technique is popular for tasks such as paint spraying. Software: The computer is installed with corresponding interface software. The use of a computer greatly simplifies the programming process.

3.4 END-EFFECTOR

Specialized robot software is run either in the robot controller or in the computer or both depending on the system design. The most essential robot peripheral is the end effector, or end-of-arm-tooling .Common examples of end effectors include welding devices, spray guns and also grinding and deburing devices and grippers other common means of picking up objects is by vacuum or magnets. End effectors are frequently highly complex, made to match the handled product and often capable of picking up an array of products at one time. They may utilize various sensors to aid the robot system in locating, handling, and positioning products.

3.5 SCANNER

A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in, and flatbed types and for scanning black-and-white only, or colour. Very high resolution scanners are used for scanning for high-resolution printing, but lower resolution scanners are adequate for capturing images for computer display. Scanners usually come with software, such as Adobe's Photoshop product, that lets you resize and otherwise modify a captured image.

Achievement of working envelop of Cartesian configuration is a rectangular prism. The robot can manipulate its maximum payload throughout the working volume. This leads to high degree of accuracy and repeatability due to their structure. Barcode scanning system are attached near. This shares information of different component model, quantity, size, range. inside a carton box scanner interface is a combination of hardware and software that allow to communicate with computer

3.6ELECTRIC GRIPPER

An Input command is sent to the gripper from a robot control unit. This unit is usually pre-programmed by an operator via a teach pendant. With most electric grippers, the command can be a position, a speed or a grip force. The robot can send commands to the gripper using digital I/O's, or by using any of the available robot communication protocols. The gripper force can be set in 1% steps. Work piece that are easy to break or deform, such as glass or spring can be gripped. The gripper force is constant even when the finger position changes.
The command from the robot is received by the gripper control module responsible for driving the gripper motor(s). This gripper module is sometimes embedded in the gripper but most of the time it consists of a box sitting between the robot controller and the gripper.

The servo-electric motor reacts to the signal. The shaft will then rotate to the commanded position, speed or force. To enable closed-loop control, feedback from the motor position is usually necessary at the gripper level. Until there is a signal change, the servo will hold the position

The servo-electric gripper can be programmed via an interface integrated to the robot control or on it's own control unit. For example, Robotics Adaptive Gripper can be controlled via a very simple Touch-Screen GUI where teaching the gripper is done the same way (and same timeframe) as using the robot teach mode.

IV. FABRICATION

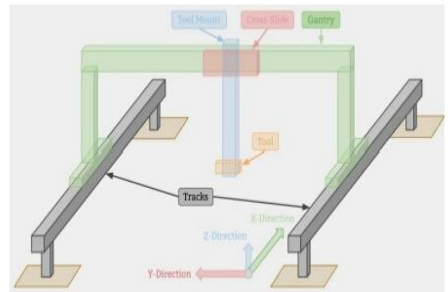
Major Components;

1.Guidway 2.Controller 3.Barcode scanner 4.stepper motor 5.motor driver 6.gripper 7.smps

4.1 HARDWARE

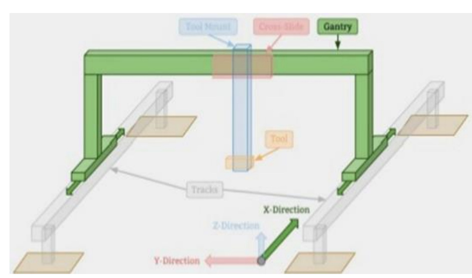
The hardware is very similar to 3D printer and CNC milling machine hardware. There are two fixed tracks in the X-direction a gantry that the tracks and moves along them_ Mounted to the gantry is a cross slick that moves in the Y-direction and mounted to that is the tool mount that moves in the Z-direction. Tooling include humidity sensors and pH sensors spaying mechanism tool. The tracks, gantry, side, tool mount design intent allow for easy scaling in the X,Y and Z directions.

4.2 TRACKS



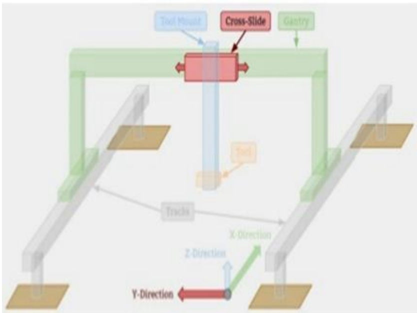
- The tracks are one of the components that differentiate this technology from traditional free. The tracks are fixed in the ground and allow system to have great precision in an efficient are Simple manner. There are many reasons of why tracks are supervisor to free. A few which are listed below
- Tracks provide great precision and allow the tool to return to the same position repeatedly.
- Any type of packing structure of plants created managed because wheel hardware pathways are no longer needed.

4.3 GANTRY



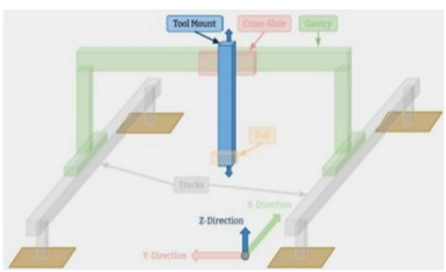
The gantry's primary structure is an upside-down square U shape. At each end of the U, are linear guide systems such as wheels that allow the gantry to move across the tracks in the X-direction. The top of the U shape serves as the bridging component and the linear guide for the cross slide. The gantry must be very rigid and have tight tolerance on the linear guide interfaces. Significant flex or play will lead to less of the tool or sensor This can especially important during high force operations that also require high precision, such as selective tilling, where inaccuracy in excess of damage &sired plants. Similar to tracks, the gantry will likely be constructed from T-slot aluminium extrusions for small scale applications and weld steel for larger scales.

4.4 CROSS-SLIDE



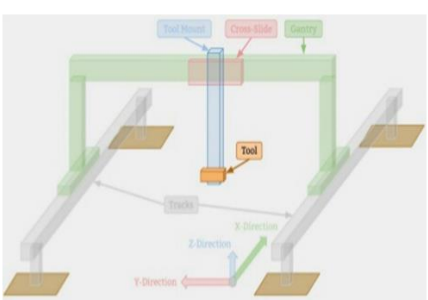
The cross slick, highlighted in moves in the Y-direction across the gantry. This motion provides the second major degree of freedom for the system and allows operations such as planting to be done anywhere in the XY plane. The cross slide is moved using an Y-direction drive system and functions as the base for the tool mount.

4.5 TOOL MOUNTS



Tool mounts attach to the cross slide and provides the system Z-direction movement as illustrated in Tool mounts serve as the base for attaching tools such as seed injectors, watering nozzles, sensors, and plows. They consist of a tall s component, a drive system, and a mounting plate or area for attaching tools to.

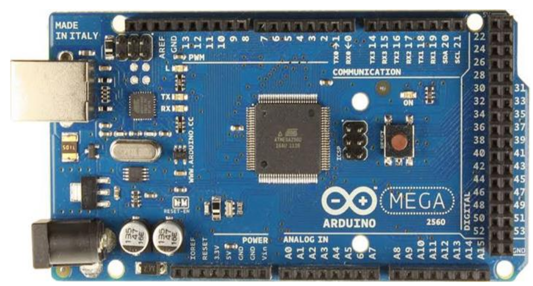
4.6 TOOLS



Tools will attached to the tool mount as highlighted, the system will likely utilize a current set of tooling, but it will generally be very similar in form and functions to existing agriculture tooling. However, it is very possible that system will open the doors to new tool design that were not feasible or appropriate to use with conventional equipment.

4.7 CONTROLLER (ARDUINO MEGA 2560)

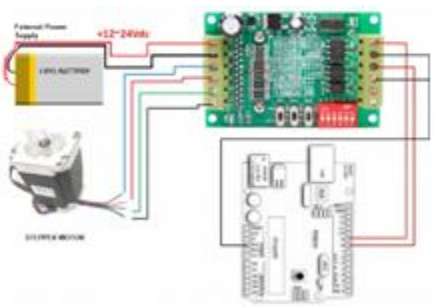
An Arduino Mega microcontroller (ATmega2S60), will be used to control the stepper motors, sensors and future electronics. This platform was chosen for its low cost, general availability, hack ability, expandability through shields, the expansive learning resources available, the strong DIY community already using the platform, and the fact that it is oven source. In addition, Arduino programs are written in the C language and therefore very familiar to many. Expansion shields likely to be used includes a RAMPS stepper driver.



4.8 STEPPER MOTOR

A NEMA 17 stepper motor with a 1.7 x 1.7 inch (43 2 x 43.2 mm) faceplate. It has more fgtgrvt6room to put a higher torque. However, its size is an indication of its power. The NEMA 17 stepper motor shown in Figure 4.8.1 has been chosen for its general availability, common use in similar projects such as the RepRap 3D printer, easy setup and control, as well as its accuracy, speed, and torque outputs. In addition, this motor with components such as pulleys and mounting plates available from many providers including Open Buids.

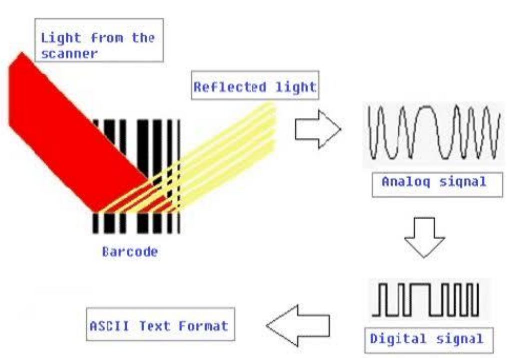
4.9 STEPPER MOTOR DRIVE(TB6560)



The Arduino Based Stepper Motor Controller Project which consists of TB6560 Stepper Motor Driver Module, TB0405 Stepper Motor and Lipo Battery. The basic working principle is being described here. When pulse is applied to CLK, the stepper motor will rotate, and stop when there is none, and the motordriver will change its current to the half current mode as setting to hold the motor stand still. And motor rotate clockwise when CW is Low level and counter-clockwise when CW is High level. Motor is enable when EN is Low level and disable when EN is High level. The EN, CW, and CLK inputs are opto-isolat

If you are connecting them directly to a microcontroller then it is suggested grounding the EN-, CW-, and CLK- pins with your microcontroller GND. In EN (Enable input) Pin providing a logic high will disable outputs to the motor. And in CW (Direction input) Pin helps in rotating the motor anti-clockwise (counter-clockwise). And providing a logic high will cause the motor to rotate clockwise. The direction of rotation also depends upon the motor coil polarity. The CLK (Step input) Pin continually pulsing the CLK+ input will cause motor to step in one direction.

4.10 BARCODE SCANNER



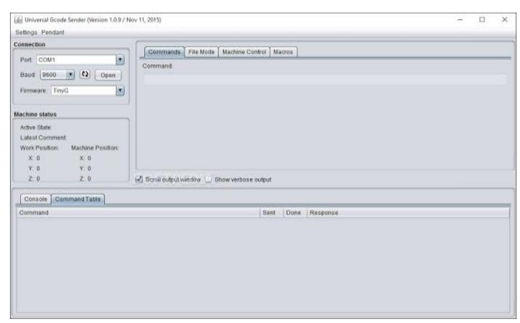
Barcode scanners begin by illuminating the code with red light. The sensor of the barcode scanner detects the reflected light from the illumination system and generates an analog signal with varying voltage that represent the intensity (or lack of intensity) of the reflection. The converter changes the analog signal to a digital signal which is fed to the decoder. The decoder interprets the digital signal, does that math required to confirm and validate that the barcode is decipherable, converts it into ASCII text, formats the text and sends it to the computer the scanner is attached to

V. SOFTWARE

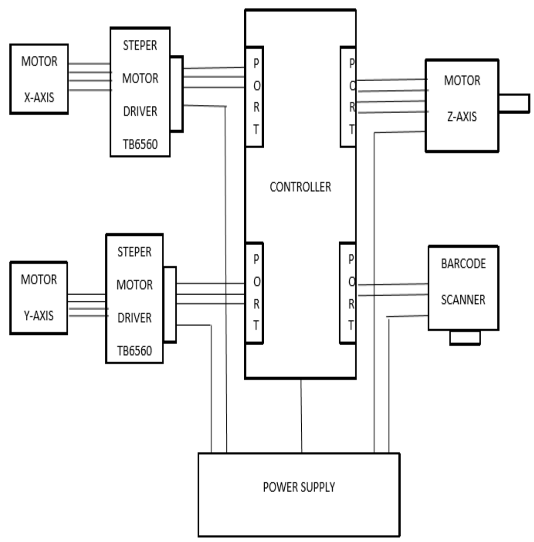
UNIVERSAL G-CODE SENDER

A java based tool that can enable the users for sending the G codes to machine supported my CNC Computer Numerical Code is Universal G code Sender. This utility can be used just through a mouse click, and it can serve the users of all of this application is to facilitate the beginners in operating certain machines. The interface has been designed to provide details about the machines state and the connecting availables. Additionally the command table covers most of the interface of the application.

Some of the function that you can perform through this applications are the achievement of precision up to decimal points removing individual components removing whitespace converting arcs into lines. The universal G code Sender can give you efficiency results for controlling the CNC based machines. The high precision and possibility of managing specific function through the PC.



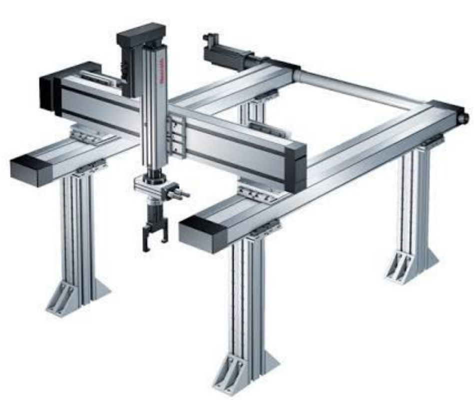
VI. CIRCUIT

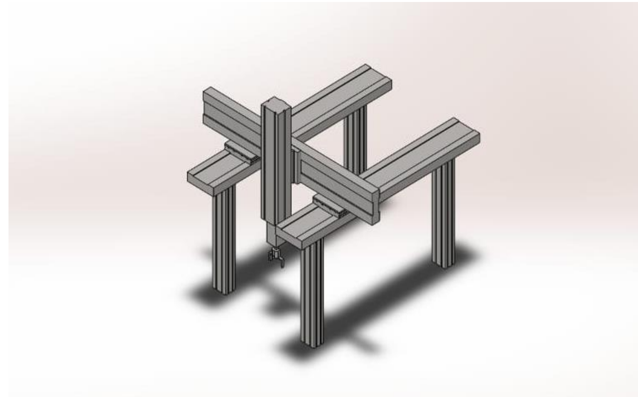


VII. WORKING PRINCIPLE

Cartesian robot process is based on the principle axes of control are linear and are at right angle to each other. By using rigid structure and electrical gripper then can carry high payloads. Which they performs some functions such as pick and placing, loading & unloading, material handling, by grasping the objects or carton box. The whole process takes place under automated systems. So this robot is free from human error, and additionally we implemented barcode scanner in our prototype, that attached near gripper to avoid mismatch a carton box details and scanner implication operations in warehouse or inventory management system.

VIII. 3DMODEL





IX.CONCLUSION

This project has the potential to revolutionize the way humanity produces food both on the small and large scale. As the vision states, the project aims to create and technology enabling everyone to grow focus and to grow focus for everyone. However, revolution will the defining metric of success in the short term. Short term success boils down to achieving two important milestones.

We analysi a literature survey related to our project in that got an innovative idea from published paper the performance of scanning process or manually is the inefficient flaws for the production line to overcome this problem we proposed a prototype in that which encounter and error of scanning a carton box.

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