iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.39412

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

A Review on AI Vision Robotic Arm Using Raspberry Pi

Ms. Bhagyashri Patle [1], Mr. Nilesh Pathrabe[2], Mr. Chaitanya Thiske[3], Mr. Roshan Varma[4], Prof. Amol Dhankar[5]
[1, 2, 3, 4]*Btech Students,* [5]*Assistant Professor, Department of Electronics and Telecommunication, J. D. College Of Engineering and Management, Maharashtra, India,*

Abstract: ***This article offers a project to format a strong robot arm that would perform multifunctional tasks. The purpose of the project is to interest all axes of manipulator to lift, supply and promote off the objects at a desired location. This requires a unique strain motion control that incorporate electric powered vehicles as a strain machine. Further experiments are achieved to implement a digital digicam based completely 3D vision machine blanketed with a computer vision set of policies to recognize object deformation and spatial coordination to control the deviation from the precise training. The vision machine requires a separate computing hardware capable of processing complex vision algorithms. We make use of Raspberry pi microcontroller for processing the vision data, one at a duration making the vision machine capable of recognizing the precise object as constant with software program commands.***

Keywords: 6 DOF; robotic arm; computer vision system; color detection; object recognition

I. INTRODUCTION

The first utilization of the phrase 'robotic' have become in the course of a 1921 Czech fantasy play – 'Rossum's Universal Robots' – with the useful resource of the usage of Author. As robot hands is concept Robotic manipulators similar to the human arm integrating particular era implies the motive of Industry 4.0. Such as, the IoT (Internet of Things), large records, AI (synthetic intelligence) and particular several custom designed production. The benefit of integrate with incorporated machine of entire paintings is that they may entire quick and correctly. The simultaneous evaluation proves that ai has correctly tailored to the evolving scope of pc vision.

The proof suggests that current production is contingent robotics. A robotic is described as a programmable, self-managed tool which encompass electronic, electric powered and mechanical units. Usually, its miles a device walking in area of an alive agent. To choose out and area devices is that the precept project in corporation environment. Robotics embody the coordination of a huge type of disciplines (strategies), which encompass kinematics, sign evaluation, data theory, pc technological know-how and implemented mathematics. An automated arm can be a robotic manipulator, usually programmable with similar abilities to a person's Arm. During this study, a robotic arm machine is supposed to carry out multifunctional tasks. It detects and identifies pink satiation object and grips the object and drops it in the course of a favoured vicinity wherein a photo graph of factors is taken through a camera. All gadgets inside aspect the photo graph are identified the usage of photograph processing strategies and every unmarried amazing gadgets' coordinate are managed at the pc and dispatched to the robotic arm.

II. LITERATURE REVIEW

1) Design and fabrication of pick and place robotic arm given by Dr. T. Sunil Kumar and K.sarath.

Designing and fabricating of the robot arm has been efficiently completed. The line diagram of robot arm is drawn in CATIA. The layout for the manipulator has been recognized. The torque exerting at every of the joints is calculated for exclusive loads. The capacity is calculated primarily based totally at the torque. Servo is used for every joint primarily based totally on torque want. Choosing a right servo controller and manipulate software program for the Robotic arm is growing the usage of MS C++ programming language.

2) Applying a 6-axis Mechanical Arm Combine with Computer Vision to the Research of Object Recognition in Plane Inspection by Joy Iong Zong Chen, Jen Ting Chang.

The layout to a wise automobile machine with the combination of electromechanical. Moreover, the principle reason of this paintings attempts to keep away from the complex manner with conventional guide adjustment or education. It is anticipated to attain the reason that the robot arm can take hold of the goal automatically, classify the goal and placed it within side the distinct region, or even flawlessly recognize the distribution thru education to distinguish the houses of the goal.

©IJRASET: All Rights are Reserved

3) Control a 6DOF Anthropomorphic Robotic Structure with Computer Vision as MEMS Input is given by Pop, and Alexandru Stan.
From the kinematic factor of view, computing the inverse kinematics version the usage of ANFIS has validated inefficient whilst imposing with the assist of the MATLAB environment. The decided on computing system become not able to offer any effects because of the shortage of resources, and probably terrible implementation of the education algorithm. The analytical method for fixing the inverse kinematics hassle raised problems for acquiring a dependable and very last machine implementation.

4) Computer vision based object grasping 6DoF robotic arm using picamera by Vishal Kumar,Qiang Wang.
In this paper gift our revel in with 6 DOF articulated robot manipulator and 3-D imaginative and prescient systems. We evolved a robot arm that can carry out multifunctional duties with the assist of laptop imaginative and prescient. It plays a few exclusive capabilities via way of means of focusing all axes of the manipulator to a preferred items and dump at a preferred location.

5) Pick and place industrial robot controller with computer vision given by Andhare, Pratiksha.
Most of the strategies of visible greedy of items are the usage of method of digital digicam established on a robotic. In this paintings, digital digicam is established now no longer on robotic, however independently above the region of interest. For that reason, there's want to transform digital digicam co- ordinate into global co-ordinate. While acting this transformation, projective geometry and houses of 2D transformation which include scaling, rotation, translation performs a crucial role.

6) Wireless Control of Pick and Place Robotic Arm Using an Android Application given by Muhammed Jabir. K1, Neetha John2, Muhammed Fayas, Midhun Mohan4, Mithun Sajeev5, Safwan.C.N.
In this paintings they made a Pick and area robotic managed via way of means of an Android utility. As its miles greater versatile, bendy and clean to manipulate and its miles an open supply software program. Here The Pick and area robotic is managed wirelessly via way of means of an Android utility referred to as Blue manipulate thru a blue enamel module. The Android OS in addition to Arduino software program are open-supply tender wares. The major function of this select out and area robotic is the tender catching arm or tender catching Gripper. They recognize that after coping with the explosive objects like bomb it ought to be treated carefully. Extreme stress will motive explosion. Suit could be very important to have a tender catching arm. This robotic has a microcontroller-primarily based totally electric load sensor which has better sensitivity than mechanical stress sensors.

A. The Application of Computer Vision
The study of the field of industrial automation Computer Vision is one of the most important application technologies in the analysis for the processing of image information. Consider some of the measured conditions, which are important factors that affect the interpretation of computer vision. When implementing positioning and sorting functions, the external light source, which is usually properly lit, is used to highlight the characteristics of the observed object such as color, shape and size, which ensure that the lens can successfully capture the image. As a result, changes in the ambient light source lead to instability in the quality of the image data. Therefore, a restoration or adaptation to the light source by means of suitable protective measures can offer the possibility of eliminating the measurement error.
Accordingly, the test environment for the inspection functions in the report is designed as a structure with general webcam lenses and an embedded system assigned as Raspberry Pi. On the other hand, the installed operating system (operating system) of the embedded system is Linux, and it is similar to the size of a business card. Input and output interfaces called GPIO (General Purpose I / O) are built into a desktop computer for the Raspberry Pi. The GPIO skeleton has 40 expandable and compliable pins and provides an excellent Journal of Artificial Intelligence and Capsule Networks environment for application development. There are also many OpenCV development libraries with open source types for image processing in the embedded system. Typically used for programming code quickly, has many programming language interfaces, and is even suitable for applying machine learning algorithms.

III. METHODOLOGY

A. Experimental Setup
Experimental setup consists 6 DOF robot in front of a working table, where rectangular objects are put. Camera is placed above the table, from where all objects are noticed and connected to machine program. We are going to sort the object on the substratum of area of object. Machine programming is done with help of OpenCV library. Machine programming includes object recognition, image pre-processing part, conversion of pixel co-ordinate into world co-ordinate using transformation properties and orientation calculation of object so that it will guide the robot through how much angle it has to rotate. Fig. 1 shows 6 DOF robot manipulator.

B. Assumptions

The experimental setup depends on visual detecting information and a few presumptions. Following postulations are noted while considering the system framework. The surface on which we put the item is uniform. The stature of surface is uniform. The optical pivot of camera is perpendicular to working table and camera is well calibrated. The camera does not move during work

C. System Framework

Fig. 2 shows the system block diagram which consists of vision sensor, mapping of camera coordinate into world coordinate, orientation calculation algorithm and inverse kinematics controller.

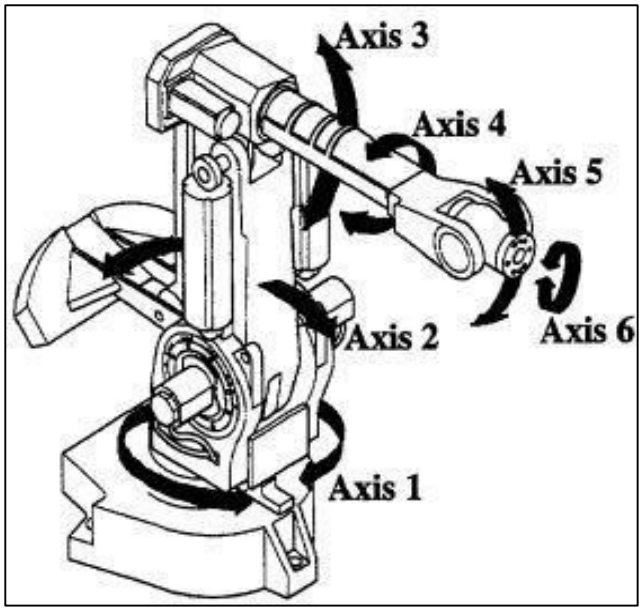


Fig. 1. 6 DOF robot

Here we utilized stand out camera, mounted over the area of interest which is utilized of object recognition, pre- processing steps. This can have another advantage as it avails for inspection of object, which eliminates desideratum of second camera. Section IV describes world coordinate conversion for position and orientation estimation algorithm. This converted coordinate will be utilized as positions in world coordinate of objects.

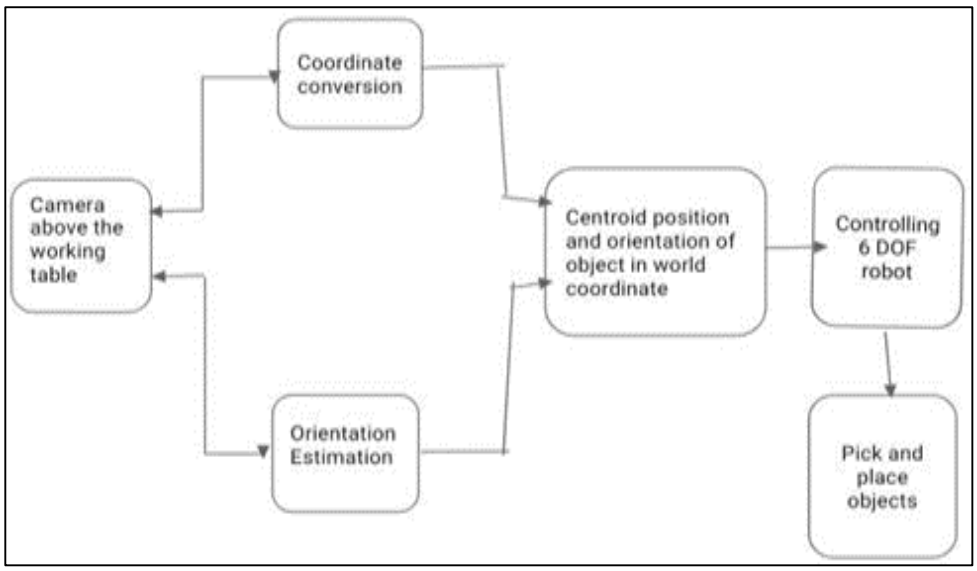


Fig. 2. System block diagram

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

IV. COMPUTER VISION ALGORITHM

Our gadget is primarily based totally on algorithms: Algorithm 1 and Algorithm 2.

Algorithm 1 is the set of rules of pink colour detection that is applied to perceive the item of pink colour. In this set of rules, for every pixel, the distance (D) among pixel fee and reference colour fee, is computed. Whereas, the edge fee is ready manually according with tolerance degree given to set of rules that is a steady fee. If the distance (D) is much less than Threshold, pixel is chosen in any other case not.

Algorithm 1 Red Color Detection
Input:
Image (RGB)
Functions:
Red Identity ()
Repeat:
For each Pixel
1: Compute the distance (D) betwee
that pixel value and reference color value
2: If D< Threshold then
Current pixel is accepted
Else
Current pixel is NOT accepted
Output:
Detect red color from red color channel
(1:0:0)

Algorithm 2 is the set of membership function identity rules that are widely used in our robot arm according to Algorithm 1, since Algorithm 1 identifies the element, at this point Algorithm 2 stores the element's proximity and then compares the element's proximity to the claw function? If the distinction is more than a mistake, then the claw moves one step further and, on the other hand, compares the locations. It will make the paintings identical until the distinction is much less than mistake. Since the difference between them is much less than failure, then the robotic arm. Select the object and put it in a privileged location.

Algorithm 2 Identify the position, pick and drop object
Input:
Image (RGB)
Functions:
Pick ()
Drop ()
Initialization:
Claw position ((x1,1),(x2y2))
Object position ((x1y1)(x??'))
Repeat:
1: Calculate the distance (d) between claw position and object position
2: If d<E
Claw position Object position
Else
Claw position Claw position - A Claw position
Output:
Identify the position, pick and drop object.

A. Object Position and Orientation Estimation

The vision processing is carried by OpenCV library which fixates on real time computer vision. It is vision library for Robot Operating System and provides interfaces for C, C++, python on Windows, Linux, MacOS, iOS, FreeBSD, NetBSD, OpenBSD and Android. We have used Python 2.7.6 having libraries like Numpy, matplotlib, Tkinter etc.

©IJRASET: All Rights are Reserved

V. CONCLUSION

A 3-d imaginative and prescient device primarily based totally on a digital digicam and a laptop imaginative and prescient set of rules to apprehend item deformation and spatial coordination/deviation from the authentic training. The 3-D visualization systems are able to detect the objects as well as their distance from the end-effector and will transmit the signals to the drive system. The vision system would need separate computing hardware capable of processing complex vision. Thing detection and collision avoidance can be achieve by adding contiguity sensors to the robotic arm.

REFERENCES

[1] Dr. T. Sunil kumar, K. sarath, Sd.Famil, A.V.S.Bhagyesh and Sk.Althaf(2020).2nd National Conference on Recent Trends in Mechanical Engineering, GIST, Nellore.ISBN: 97881-936274-0-216 –"Design and fabrication of pick and place robotic arm"

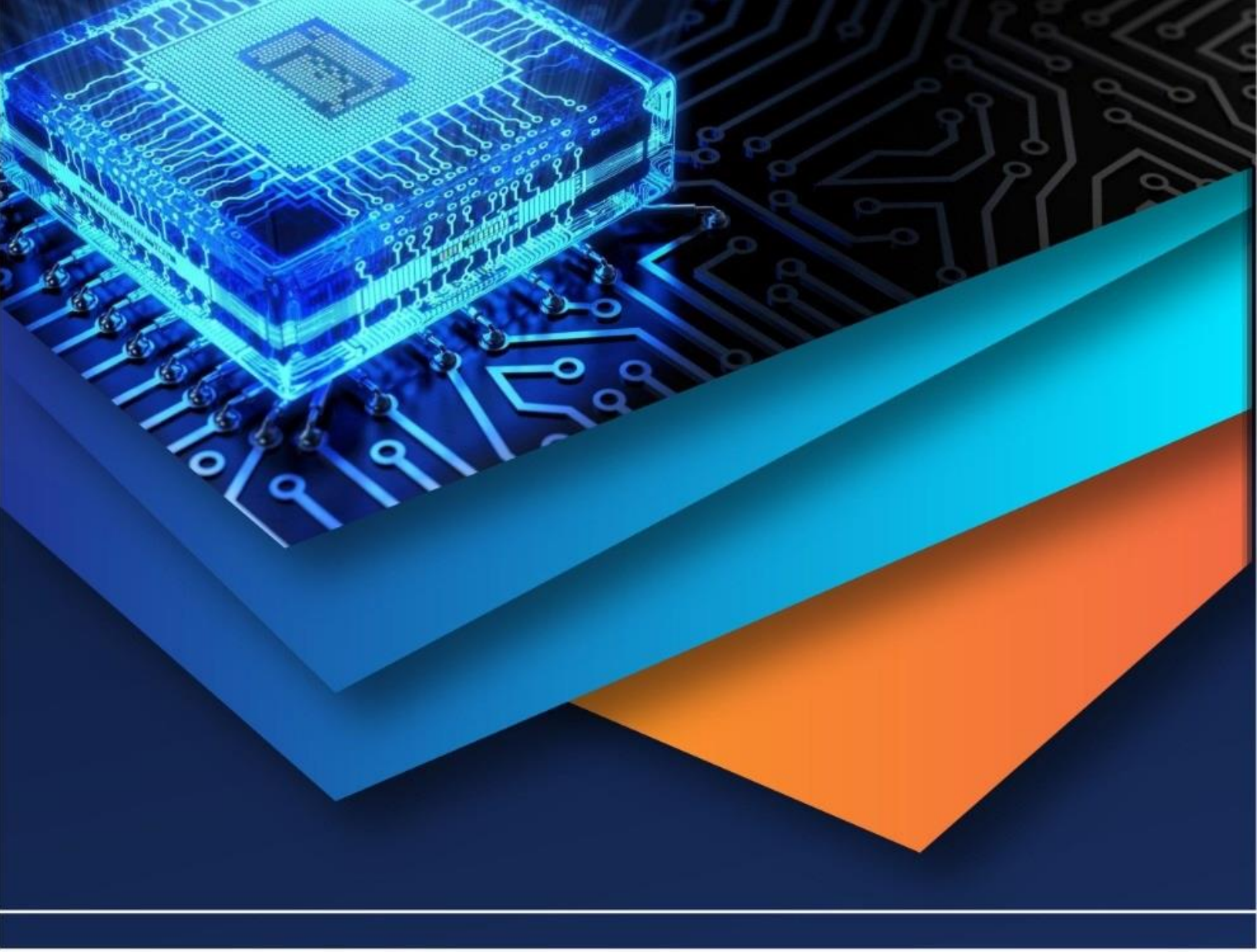
[2] Joy Iong-Zong Chen, Jen-Ting Chang (2020). Journal of Artificial Intelligence and Capsule Networks (2020) Vol.02/ No. 02 Pages: 77-99- "Applying a 6-axis Mechanical Arm Combine with Computer Vision to the Research of Object Recognition in Plane Inspection" http://irojournals.com/aicn/DOI:https://doi.org/10.36548/jaicn.2020.2.002

[3] Pop, Alexandru; Stan, Ovidiu (2019). [IEEE 2019 22nd International Conference on Control Systems and Computer Science (CSCS) - Bucharest, Romania (2019.5.28-2019.5.30)] 2019 22nd International Conference on Control Systems and Computer Science (CSCS) - Control a 6DOF Anthropomorphic Robotic Structure with Computer Vision as MEMS Input. (), 700–706. doi:10.1109/cscs.2019.00125

[4] Vishal Kumar, Qiang Wang (2018). [IEEE 2018 4th International Conference on Control, Automation and Robotics (ICCAR)-Auckland, New Zealand] – "Computer vision-based object grasping 6DoF robotic arm using picamera" doi:10.1109/ICCAR.2018.8384653

[5] Andhare, Pratiksha; Rawat, Sayali (2016). [IEEE 2016 International Conference on Computing Communication Control and automation (ICCUBEA) - Pune, India (2016.8.12-2016.8.13)] 2016 International Conference on Computing Communication Control and automation (ICCUBEA) – "Pick and place industrial robot controller with computer vision". (), 1–4. doi:10.1109/ICCUBEA.2016.7860048

[6] Muhammed Jabir.N. K1, Neetha John2, Muhammed Fayas, Midhun Mohan4, Mithun Sajeev5, Safwan.C. N6(2015) International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering – "Wireless Control of Pick and Place Robotic Arm Using an Android Application" (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 4, April 2015



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)