



# AUTOMATIC TARGET RECOGNITION BY ROBOTIC ARM

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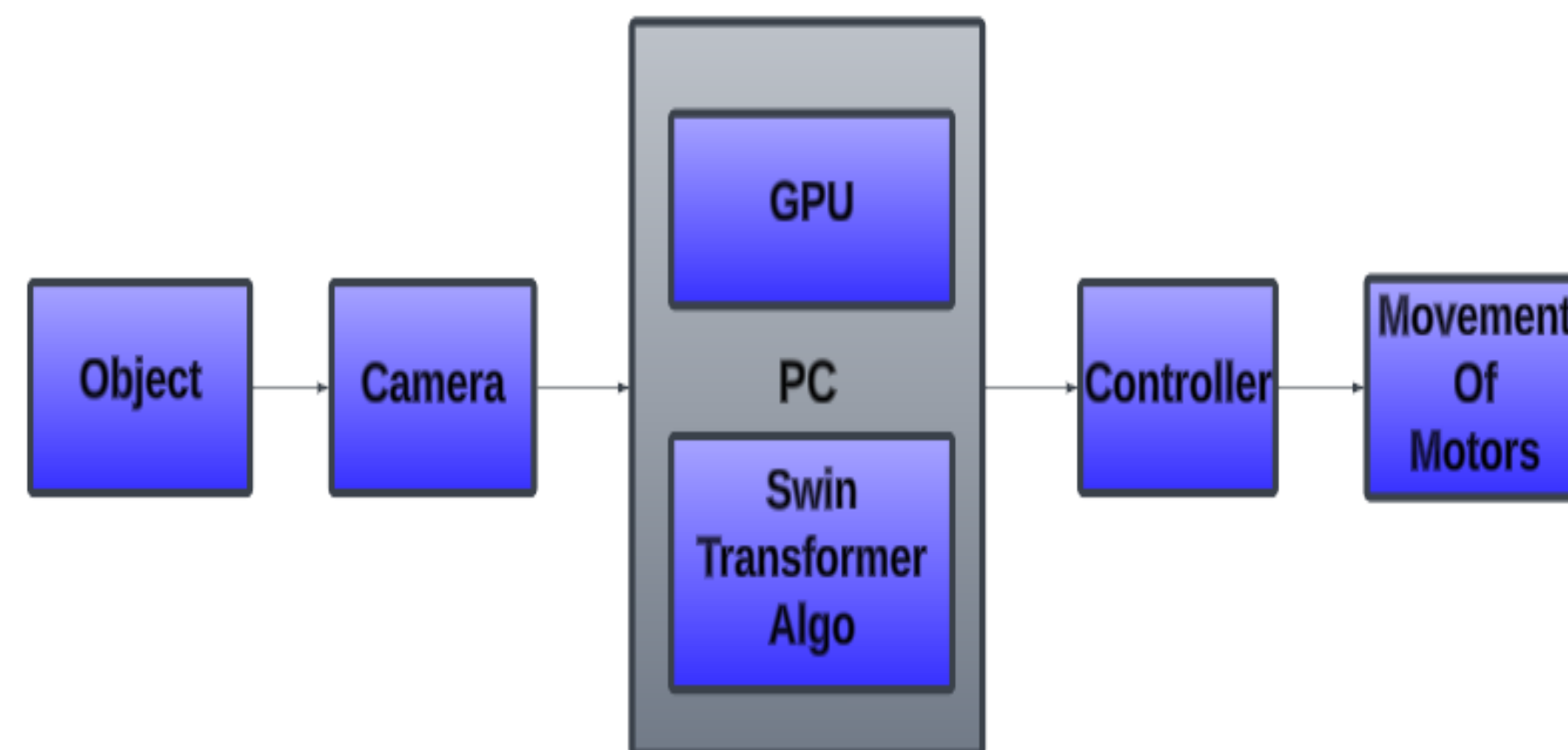
## Abstract

Automatic Target Recognition (ATR) by a robotic arm is a process in which a robot uses various sensors and algorithms to identify and track a specific target. We have used swin transformer algorithm and 4 degree of freedom robotic arm along with camera (camera type OAK-D). The robotic arm is then able to move and manipulate objects based on the target's location. One of the key challenges in ATR by a robotic arm is dealing with variations in the target's appearance or location, as well as the presence of other objects or obstacles in the environment. Overall, the goal of ATR by a robotic arm is to improve the robot's ability to detect and interact with a target in a dynamic and uncertain environment, ultimately making the robot more autonomous and efficient.

## Introduction

We are Living in the Era of Technology and Artificial Intelligence. Robotics and Artificial Intelligence are going to be our future. Keeping in mind about the Robotics and artificial intelligence and their coming Future We have Developed an Automatic target recognition system by robotic arm. An automatic target recognition is a real time or non-real-time image or signal understanding system. it detect, identify and tack the dynamic object by using robotic arm then pick the dynamic object and place it on another location by using swin transformer .

## Block Diagram



## Methods and Materials

### Tools and Hardware Used:

- OAK-D Camera
- Servo Motors
- Object (cube)
- GPU
- Arduino UNO
- Robotic Arm

### Methodology:

1. Image is taken from the camera as frames.
2. Camera is mounted on top and connected to computer system.
3. Our project is using the algorithm of swin transformer which build features map by merging image patches (shown in gray) in deeper layer.
4. After processing it will be handed to the controller, that move the motors according to the coordinates and robotic arm moves accordingly.

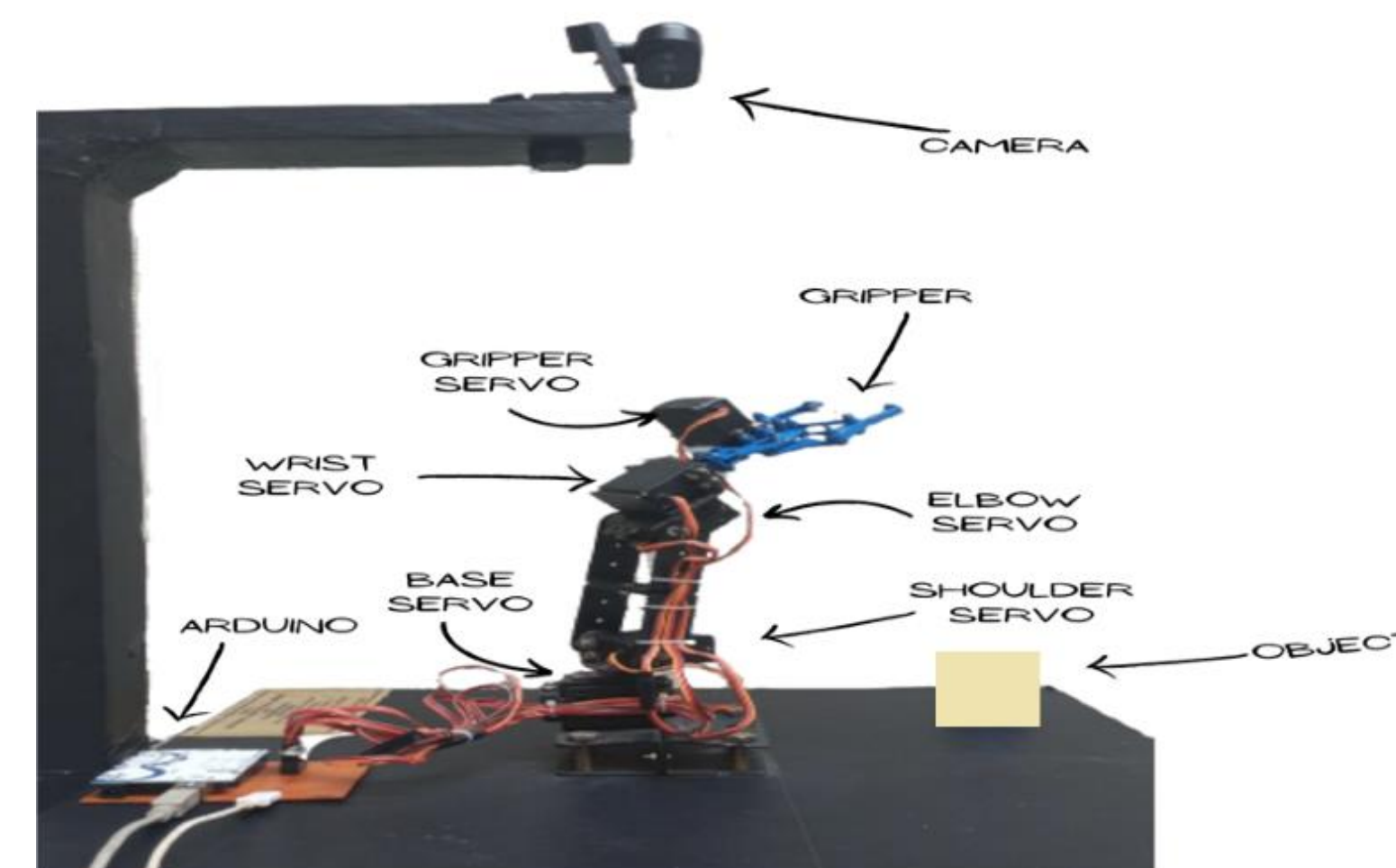


Figure 1. Robotic Arm With top Mounted Camera

## Objectives

- Detection of moving object under robotic arm.
- Identification of detected object and tracking of object of interest.
- Pick and place the targeted object.

## Conclusions and Future Work

### Conclusion:

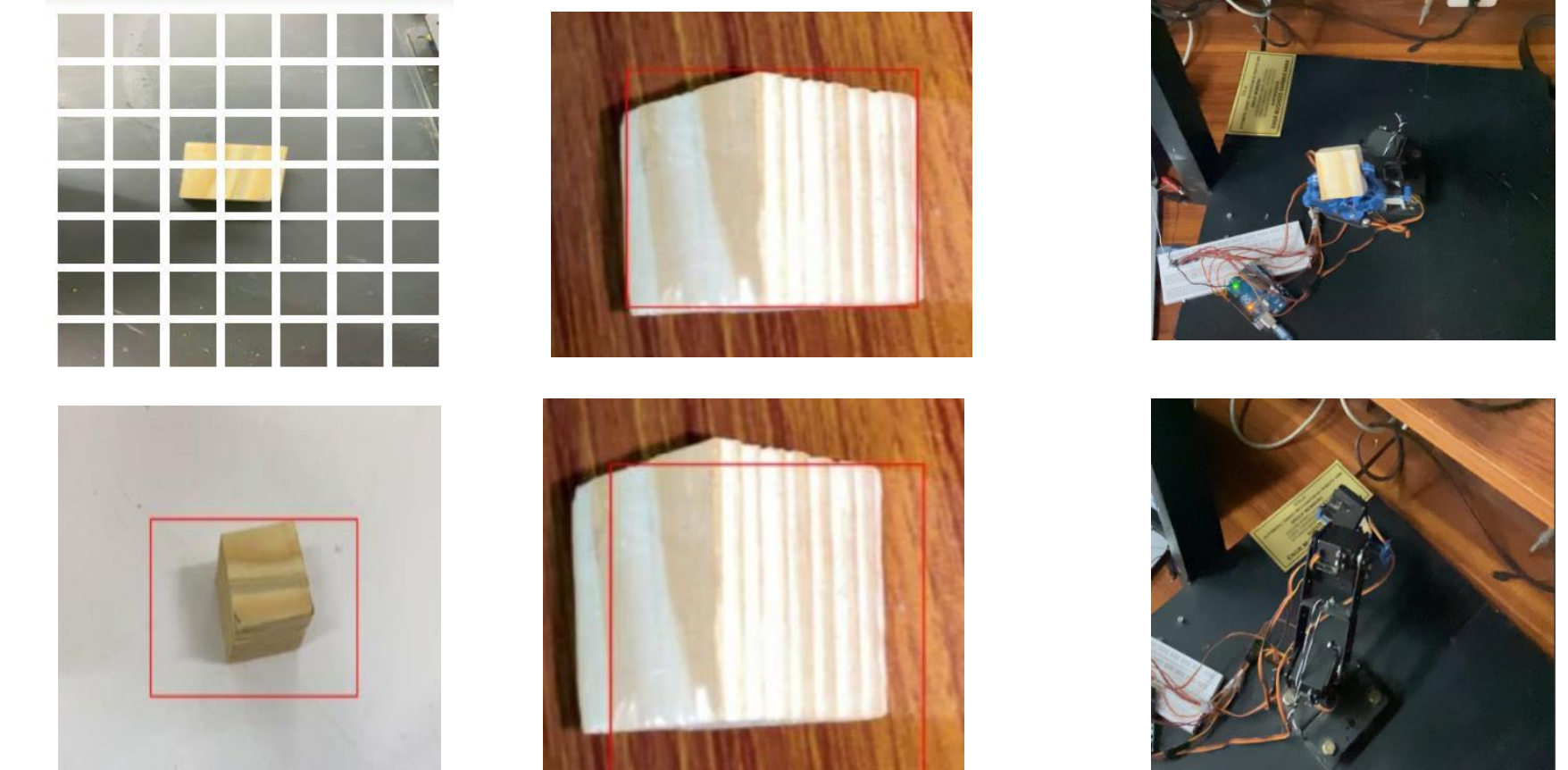
- A smart robotic arm that automatically identify, detect and track the dynamic object and pick and place the targeted object.

### Future Work:

- Future research on the Swin Transformer and robotic arm for autonomous target detection could concentrate on improving the system's versatility and real-world usability.
- To make robotic arm Gesture Control.
- Speed and performance, particularly in complicated situations with numerous targets or difficult lighting conditions, can yet be improved.

## Results

- We successfully Design and implemented a 4DOF Robotic Arm with top Mounted Camera and perform detection and tracking by using swin transformer algorithm.
- operations. Robotic Arm is Successfully Recognizing the object and performing pick and Place



## References

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- [2] Kumar R, Lal S, Kumar S, Chand P. Object detection and recognition for a pick and place robot. In Asia-Pacific world congress on computer science and engineering 2014 Nov 4 (pp. 1-7). IEEE.

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