



Optical Targeting System

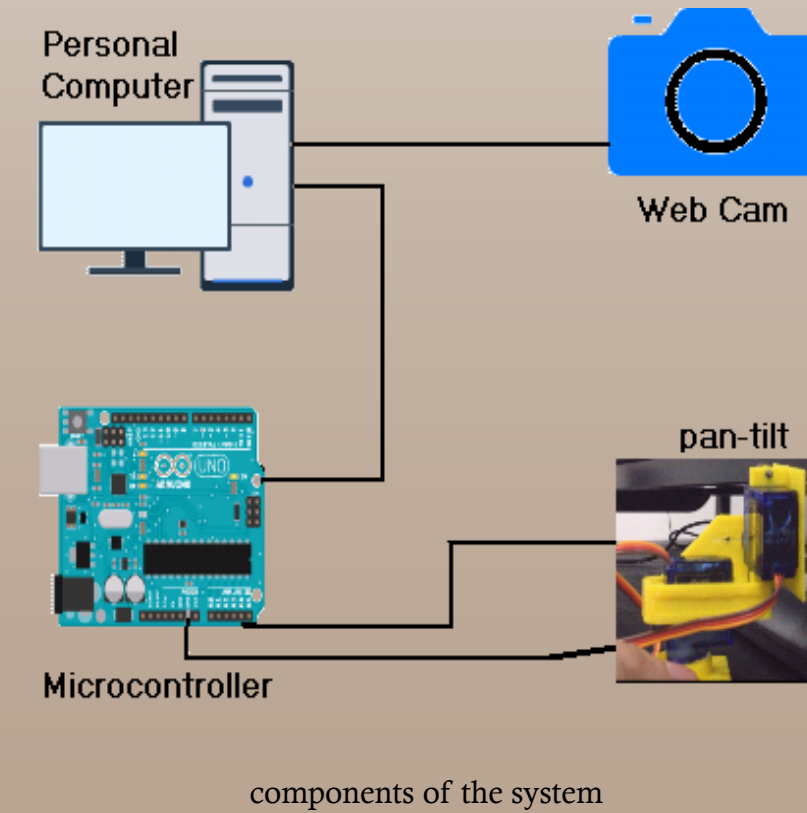
Hamad Al-Owayidh, Sulaiman Al-Matrudi, Mohammad Al-Shethri | Supervised By: Dr. Ahmad Masoud, Dr. Wessam Mesbah | Electrical Engineering Department, King Fahd University of Petroleum and Minerals

Overview

Design and implement a visual targeting system. The system will automatically detect and track a moving target until it moves out of vision field. At this point the system will return to a default position. Targets can also be selected manually using the mouse.

The system has the following components:

1. pan-tilt platform with pointer and camera attached
2. interface circuitry
3. optical tracker
4. orienting controller

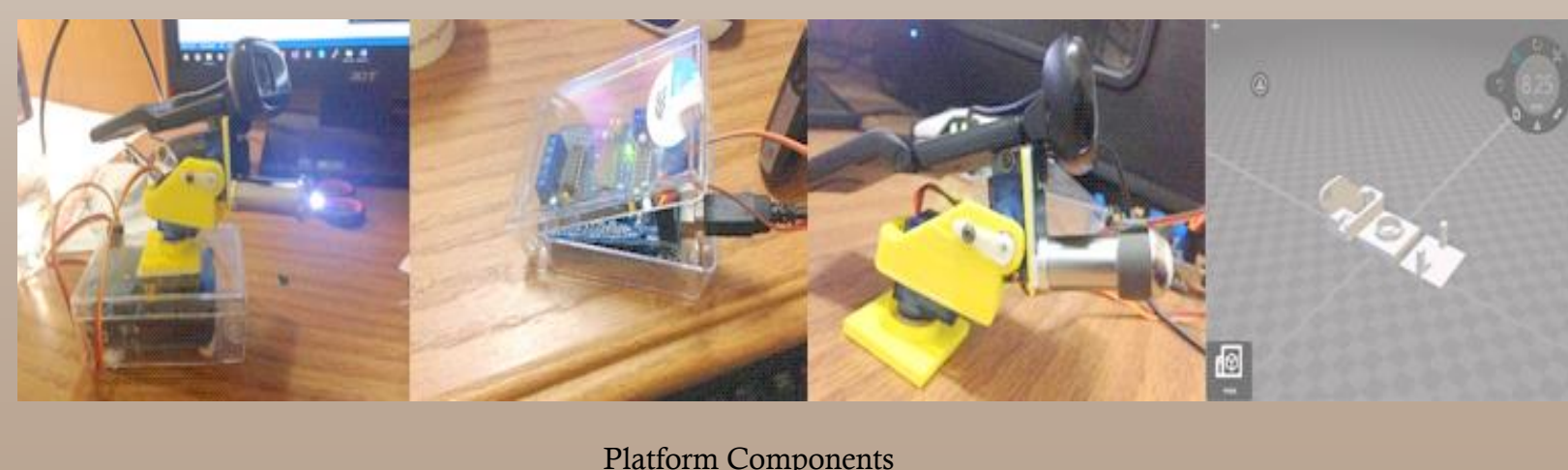


Constraint on operation:

1. Components are cheap and easily attainable.
2. 5W maximum Power input.
3. The probability of detection more than 90%.
4. The image frame rate is 10-30 fps.

Pan-Tilt Platform

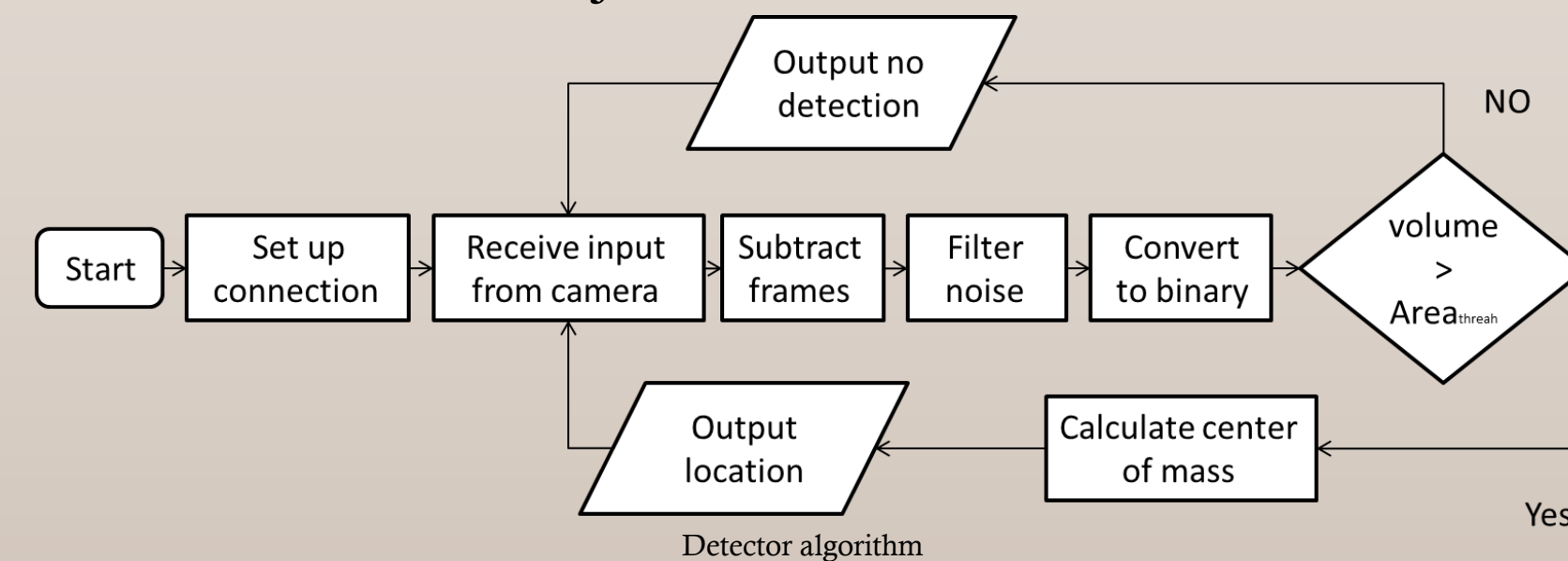
The pan-tilt platform was constructed using FabLab 3D printers from a premade design. The LED holder, webcam and base container were attached with the platform to make a compact system.



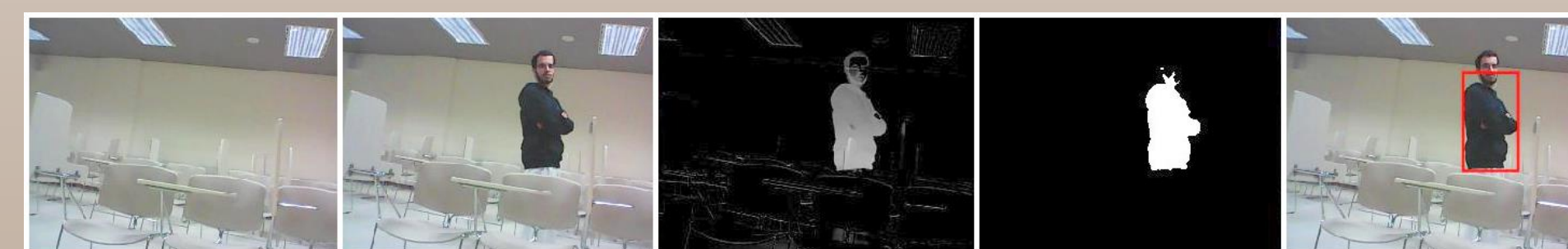
Optical Detector & Tracker

The objective of the detector function to:

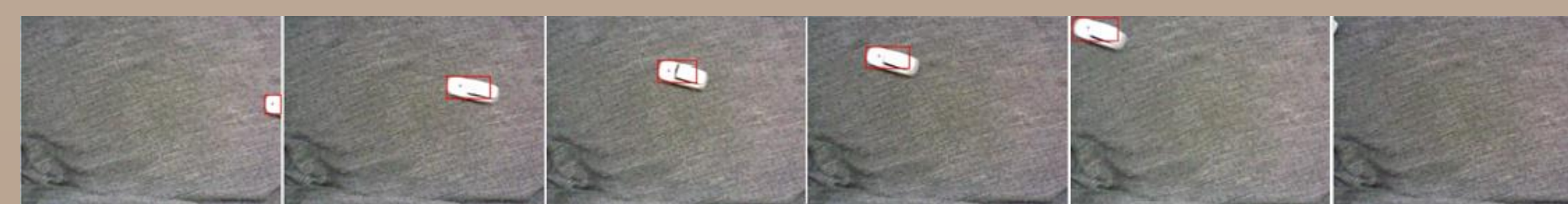
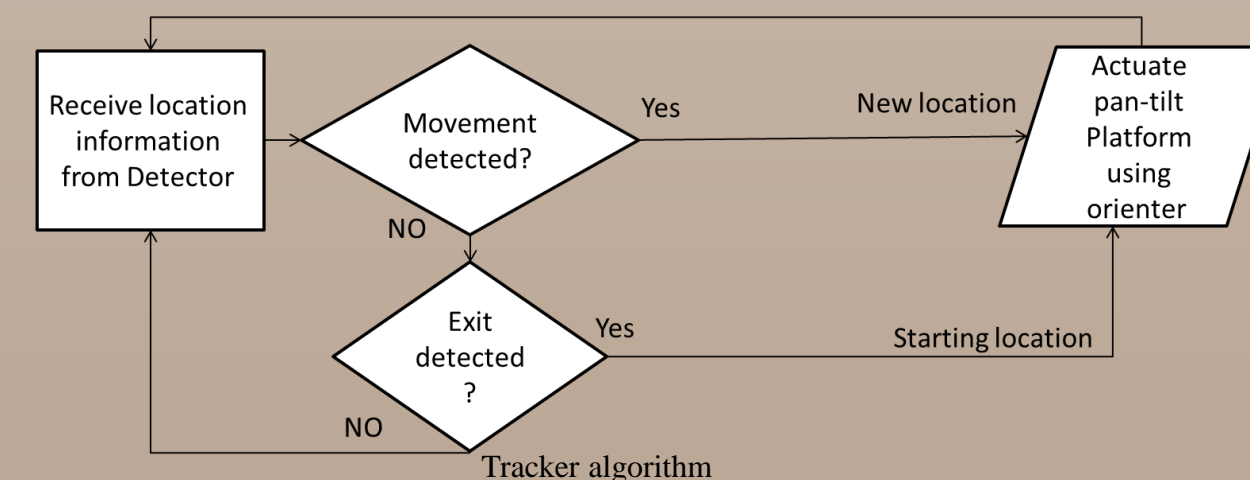
1. detect & localize object entrance to the visual field of the camera
2. track the object while it is in the visual field
3. detect and localize object's exit.



The detector uses temporal differencing to create a difference image of the new components in the visual field. The difference image is then filtered and logic is applied to determine the events of interest.

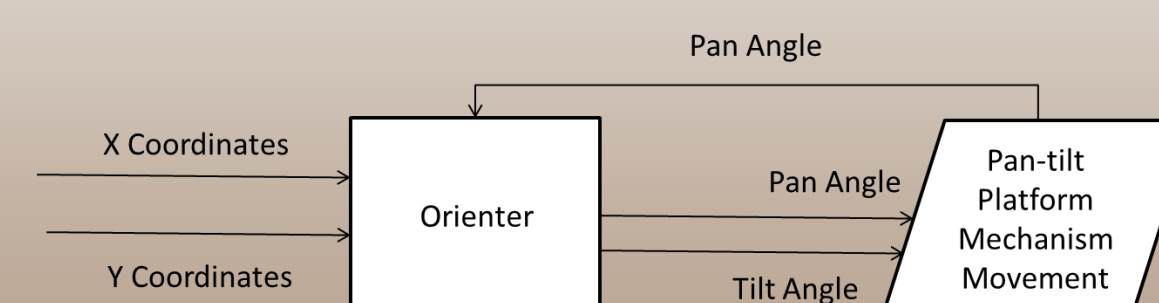


A pictorial view of the stages of the detector.



Orienter

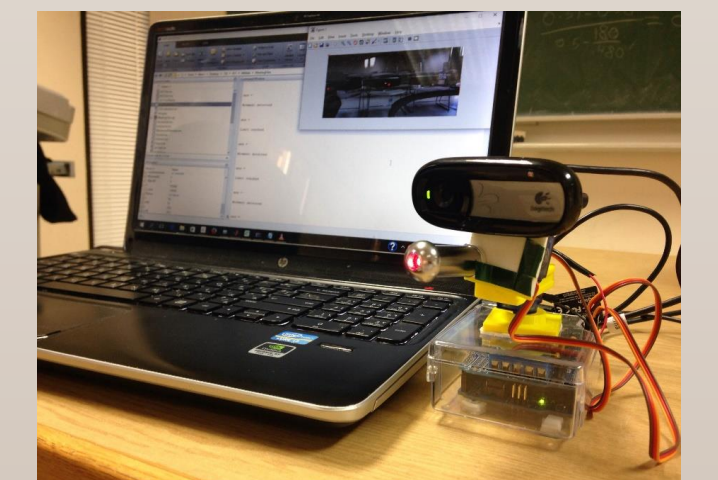
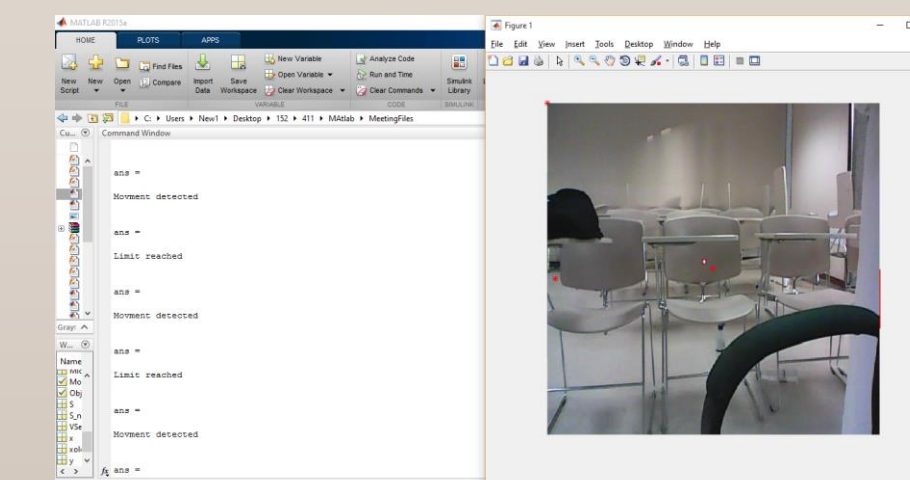
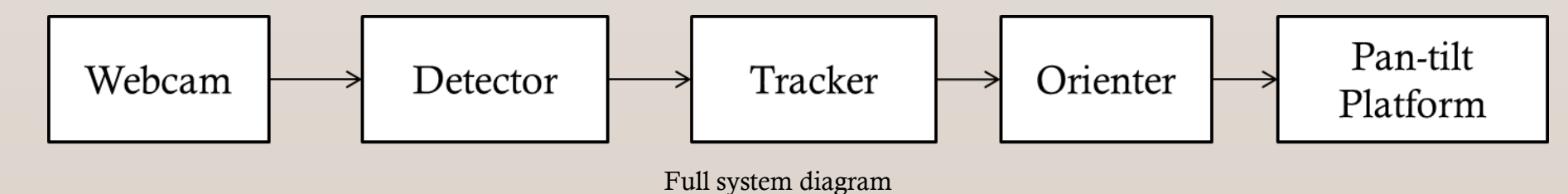
The orienter takes input location from tracker and actuates platform such that the input is at the image center.



Orienter moving the platform via mouse click to center the selected point in the image.

Integrated System

After completion of each part the system was integrated by connecting components while adjusting tracker logic as needed.



The system was tested in well-illuminated room and found to be able to follow a moving target. The performance deteriorates greatly under extreme conditions such as a very dim lighted room.

