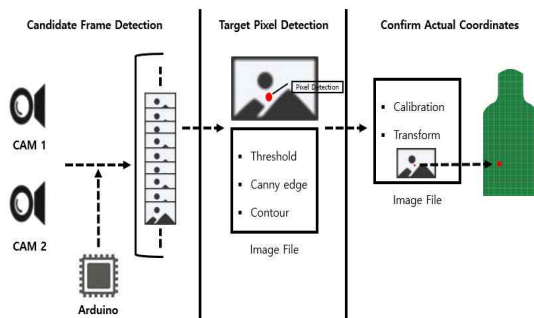


Target Sensing for High Speed Flying Object using Image Processing

Motivation

- ❖ The project researches the target system using an Image processing method for measuring the moving object at a high speed.
- ❖ Measuring a fast-moving object is very difficult.
- ❖ Currently, Car, CCTV, plant factory has already utilized the advantage of infrared, ultrasound and radar.
- ❖ In particular, military and sport shooting hasn't applied the technology yet, they really need the technology for measuring high speed object.
- ❖ The target system detect the frame of the object using the infrared camera, and check the actual coordinates of object by using Canny Edge, Contour, Calibration, Transform process, and Threshold.
- ❖ It is useful for military and sport shooting fields in the future.

System Design



Overall System Architecture

- ❖ Through the two cams when the right image of the target object with the transport is in the temporary buffer, Arduino will transfer a signal from a vibration sensor through the main system.
- ❖ The Target Pixel Detection process, the frame of the detected object is detected by a difference image.
- ❖ Finding the pixel of the object is detected through the Threshold Image Processing, Canny edge is obtained at the center point of the rectangle drawn on the detected pixel as a square, and then Contour.
- ❖ Calibration is the process of applying the pixel values obtained through the image processing in real world coordinates. Finally, the pixel values are converted by a Transform with real coordinates.

Method I

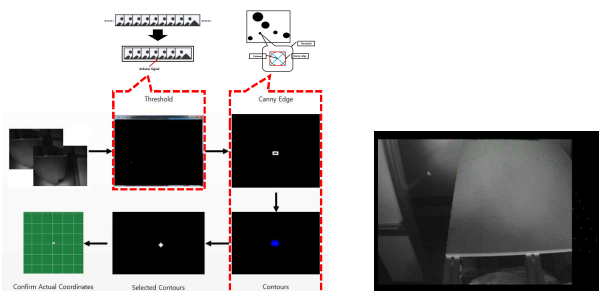


Image Processing Flow

Calibration Image

- ❖ Method 1 : Camera looks at the target in front of the board.
- ❖ It shows the central pixel value is calculated as the position coordinates through Transform.

Method II

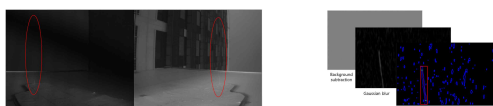
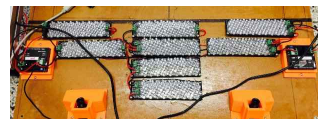


Image Processing Flow

- ❖ Method 2 : Camera observes the trajectory of the flying object.
- ❖ This method is passed through the five sensing steps (Background subtraction, Gaussian blur, Threshold, Canny edge and Contour).

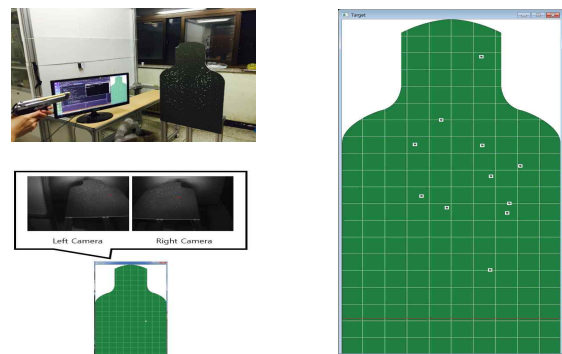
Hardware Infrastructure



Kind	Quantities
IR CAM (Sony eyes camera)	2 EA.
IR Transmitter S50cm (KID05BW85)	144x8=1,152 EA.
LED Controller	2 EA.
Arduino Uno	1 EA.
Piezo Sensor	2 EA.

System Arrangement and Hardware Kind

Simulation



Experiment using Target System

- ❖ It launches from several places to ensure that the entire shooting is accurately sensing the plate. Sensing the error of the on-screen mm make sure that there are exact.
- ❖ The resulting image shows that implemented method 1 through image processing launched from a number of BB bullet.