

## Smart Autonomous Camera Tracking System Using myRIO With LabVIEW

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**ABSTRACT :** Tracking in real time is one of the major issue or task which can be performed for variety of purposes like in surveillance for monitoring any kind of dynamic scenes for safety purposes. So here in the proposed system a colour myTracker is developed using the NI myRIO module which is vision surveillance. The tracker tracks the colour based vision and its acquisition. The myTracker designed monitors the fed in ROI in the LabVIEW program. If the status given matches with the colour track mode, the webcam tilts/pan accordingly. We also look into the manual mode where the webcam proposed changes its state or position as the cursor of the system connected to it. In the proposed system we use the NATIONAL INSTRUMENTS LabVIEW programming which is the main part of the proposed system. The hardware module used here is the NI myRIO-1900 Student Embedded System which has number of features and specifications which would be discussed. Here a software related to NI i.e., Vision Acquisition is taken for the video or image processing techniques and it performs various tasks like Set image conversion of the image data and grabbing of the video or modifying the resolution.

**KEYWORDS-**LabVIEW, myRIO, Tracking Camera, Tilt/Pan Motor

Date of Submission: 05-05-2018

Date of acceptance: 21-05-2018

### I. INTRODUCTION

In our security desired society, administrative organizations are being furthermore focused in spy/surveillance functions that may or can be mechanized. The operations comprise to follow the motion of colour in the video utilizing unvarying or moving scenes and the categorization of various colour understanding systems. So, the tracker for colour will be the first priority or the step taken with respect to the above discussion. Customer compass instances, auto-focusing through the digital systems, gaming are few other applications. The success for these various functions Real-time detection must happen.

Region-of-Interest tracking is utilized here in this paper, which is a research area in depth level. Considering the ROI tracking problems in the field of object based on video processing, it is an important problem faced today. Thus when a physical object appears in various frames numbers, the main focus is to identify the appearance in those frames for the process. Therefore the colour and the geometric features are the two characteristics which are needed for the ROI tracking.

The proposed self-governing system go on as a visual established tracking system, utilizing a HD WebCam using the IMAQ software which has been fixed on a servo motor technique mechanism and provoked by a myRIO. The system is very well used for automatic WebCam locating or for security purpose applications and thus greatly reduction in various human operations. The project is a great tool to learn more on image processing, wireless data streaming, servo control and challenges coupled with various face identification in varying conditions as well as camera movement.

### II. MOTIVATION

The incentive motive for the proposed system is to

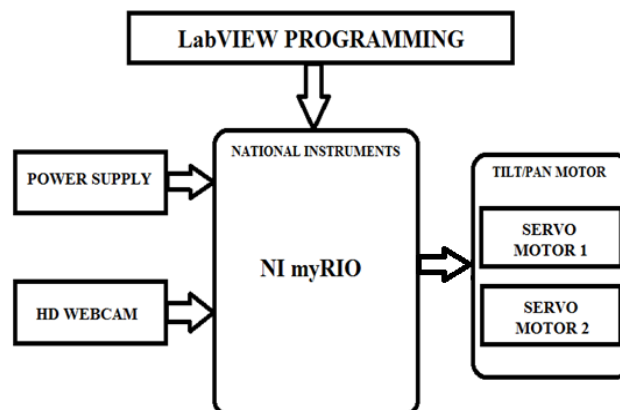
- To develop a smart real time autonomous tracking camera by using LabVIEW with myRIO.
- The developed system should be robust against complex situations like illumination variations or deformation.

- The system is implanted using the real time video sequence continuously from the HD webcam
- ROI is contoured for the colour and fed into the program.
- The tracking takes place by easing of the motors used.

### III. OBJECTIVE

- Following the movement of colour using a camera
- The tracking must should be carried in real-time and reduce human work for the tracking purposes
- To improve the machine vision concepts on self-governing bases
- To produce an automated and higher quality system than the existing one using myRIO

### IV. PROPOSED TECHNOLOGY



**Fig 1 Proposed Block Diagram**

In the proposed block diagram we use the national instruments myRIO module which consists of various features as discussed in the future chapters. The myRIO module is connected to various software and physical peripherals as shown in Fig 1. The power supply will always be given to the myRIO and cannot be switched off at any circumstances. Then the image or the video capturing is done with help of the HD camera which has the colour sensor in it. First before starting with the complete setup, the webcam is checked if it supports the myRIO module. Then we have utilized two servo motors as shown in Fig 1 for the two axis rotation on the tracking basis. One of the motor is used for the tilting purpose and the other motor for the panning purpose. As for the webcam a test program is written for the rotation of the servo motors together and then setup the whole project. When we consider the software part of the proposed system the LabVIEW program has been written for the tracking purpose and will be dumped on to the NI myRIO which in turn run the system for the needful purpose.

### V. WORKING PRINCIPLE

The flow chart gives a brief methodology of the proposed system i.e., Fig 2. Firstly, the myRIO has to be connected to the available wireless networks and the steps are discussed. After this the RT.vi is deployed on the module and its run. Once this is done next the HOST.vi is run. Now the initialize frame of the RT.vi will run and initializes Camera, Network Streams, State Machine and ROI information required for colour matching, Stop and Motor FGV, PAN motor and the TILT motor. Then the INITIALIZE RT.vi auto detects the available cameras and loads the configuration. The STM library is utilized here to read/write properties of the references and then the resolution of the video mode will be found. Here the Vision Acquisition comes into picture and grabbing carried out and configures. The size is set by IMAQ Set Image which modifies the resolution of the video grabbed. Here if the mode is colour tracking then the ROI co-ordinates are set up and goes with the colour matching and tracking as desired. Now, the program goes into the HOST.vi and starts with the initialize frame and initializes Devices and Network Stream, FGV for stop condition. Please note that before running the HOST.vi the IP address of the Target myRIO network in use should be updated. At the same time the NUMPAD current status will be checked at every point of time and there are three modes of operation on the input of the NUMPAD.

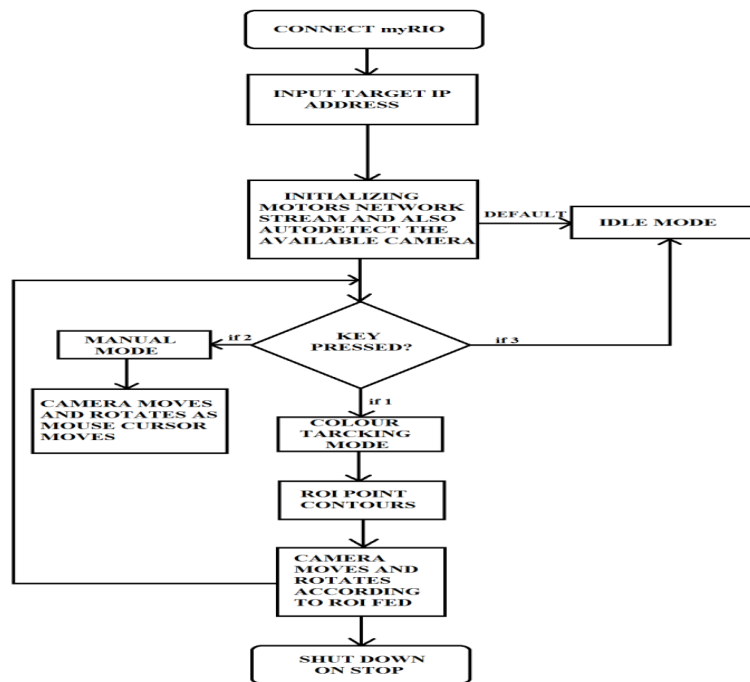


Fig 2 Flow Chart

As shown in the flow chart NUMPAD inputs 1, 2 and 3 are included. If the NUMPAD reads 1 then it is in the colour tracking mode. If the NUMPAD reads 3 then it is the idle mode which is the default mode. Then the input of NUMPAD is 3 then the program runs in the manual mode where the camera moves and rotates according to the mouse of the system. Then in the colour tracking mode the Webcam moves and rotates with the movement of the colour shown in front of it. The motor control loop in the RT.vi updates its status at each and every point of seconds. The program shuts down once the stop is given in the program. Different Modes of operation is as discussed below.

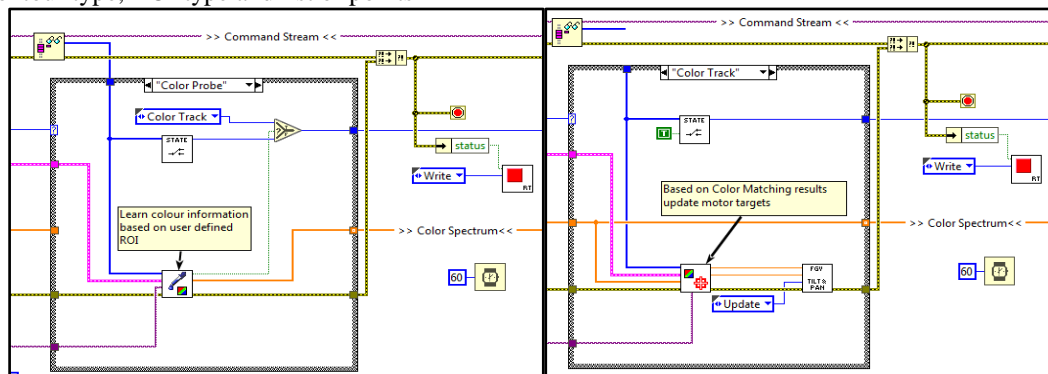
**3.1 Idle Mode**

1. Initializes Camera, Network Streams, State Machine and ROI information required for colour matching
2. Initializes Stop and Motor FGV
3. Initializes PAN motor and the TILT motor
4. Initializes Devices and Network Streams and also the FGV for stop condition
5. Initializes FGV for stop condition

**3.2 Camera tracking using Tracking Mode (ROI)**

The ROI contains two main elements in its descriptor;

1. GLOBAL RECTANGLE: This is a rectangular bounding which entirely encloses the ROI. It is defined by four points and cluster of two elements.
2. CONTOURS: it is actually clusters of array which comprises of three different elements and they are; Contour type, ROI type and list of points



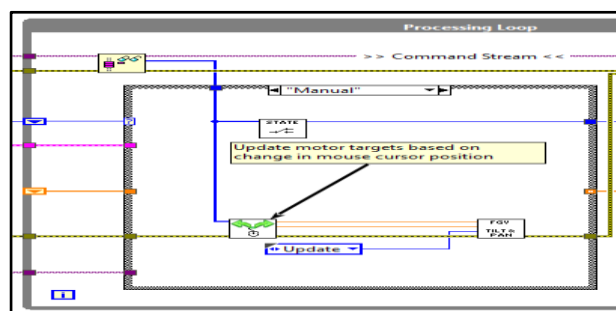
Loop for Colour Probe Loop for Colour Tracking

**3.2.1 Algorithm:**

1. If key pressed is 1
2. The data from “Read Single Element From Stream” gives the data out in the RT.vi
3. Colour Probe.vi initializes for the Tracking mode.
4. Learns the colour information based on the user defines ROI
5. Checks Tracking?
6. If true then outputs the colour tracking state
7. The colour spectrum is selected and checks the Select condition i.e., S? t:f
8. Now colour tracking.vi is initialized
9. Based on colour matching with user defined ROI motor targets are updated
10. Updates FGV.vi continuously and the camera tracks according the movement of the colour in front of it

**3.3 Camera Tracking using Manual Mode**

Manual Mode is the tracking of the camera as the movement of the cursor. The Acquire Input Data.vi plays an important role.



Loop for Manual Mode

**3.3.1 Algorithm:**

1. If Key pressed is 2
2. The data from “Read Single Element From Stream” gives the data out in the RT.vi
3. Manual control.vi is initialized
4. Updates the motor targets i.e., the Tilt target and Pan target changes according to the mouse cursor position
5. Updates the FGV.vi

**VI. RESULTS AND DISCUSSIONS**

**Setup of the Proposed Technology**



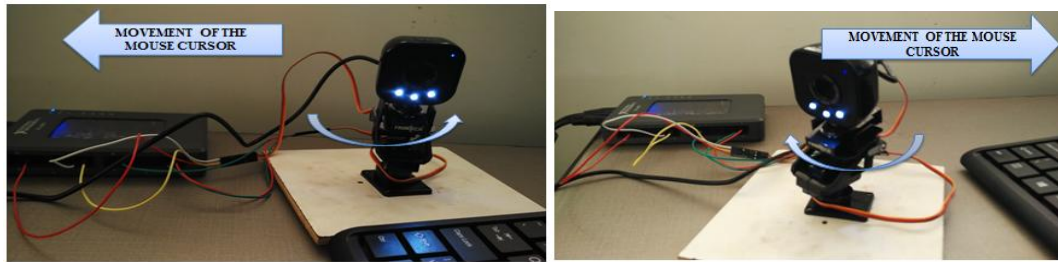
Front panel and the observations for the three modes are as discussed below:

**1. Idle Mode (Default)**

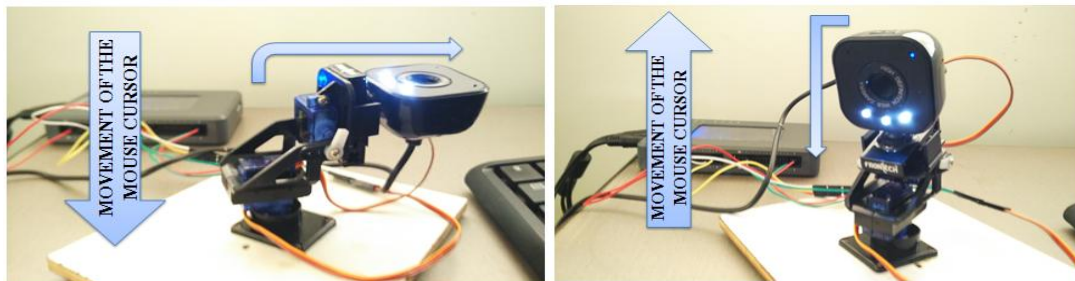


FRONT PANEL for the IDLE Mode is as shown and the camera displays the current state in the front panel.

## 2. Tracking observed for Manual Mode



Camera position when cursor moved left. The above shows the movement of the cursor mouse and the movement of the camera where the lower servo motor moves to the right(PAN). Camera position when cursor moved right. The above shows the movement of the cursor mouse and the movement of the camera where the lower servo motor moves to the left(PAN)



Camera position when cursor moved down. The above shows the movement of the cursor mouse and the movement of the camera where the upper servo motor moves to the up (TILT). Camera position when cursor moved up. The above shows the movement of the cursor mouse and the movement of the camera where the upper servo motor moves to the down (TILT)

## 3. Tracking observed for the Tracking mode

Observations for the movement of the camera in TRACK Mode where when Key 1 is pressed the track mode is ON



## VII. CONCLUSION

The proposed system as discussed above is working accordingly as shown in the result part. The webcam used here detects the colour which is fed by the ROI co-ordinates in the program. The ROI is the region of interest which has to be tracked and the motor moves with the tilt/pan in both the directions. The manual mode with the NUMPAD given with the 2 is detected and the setup moves with cursor as desired. The movement of the cursor and its camera positions are discussed above. In the colour tracking mode, the camera is taking the colour value and the setup of the camera is working as desired and discussed. Furthermore, the proposed technology can be utilized and applied for face detection and tracking process.

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