Object Tracking Automated Camera

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Introduction

Because of the advance in surveillance systems, object tracking has been an active research topic in the computer vision community over the last two decades as it is an essential prerequisite for analyzing and understanding video data. Tracking an object is to get its spatial-tempo information by estimating its trajectory in the image plane as it moves around a scene, which in turn helps to study and predict its future behavior. Enhancement of object tracking systems is building up a pan tilt moving cameras based on the movements of the detected object by combining the object tracking and computer vision technologies with microcontrollers. These systems are capable of continuing the tracking even though the object runs away from the boundaries of the normal still camera. Therefore, this research project was carried out to develop an object tracking Pan Tilt moving automatic camera with a low cost and better performance.

Methodology

This proposed system mainly consists of two modules such as a hardware module and a Software module. The Software module comprises of image processing algorithms and tracking algorithms. The hardware module consists with a Pan Tilt moving camera that was used to take video inputs and a Microcontroller to pass the control instructions to the Servo motors attached to the Pan Tilt mechanism.

In this proposed system the video from the camera was processed using Digital Image Processing (Kirillov, 2008). The video was read as frames (Kirillov, 2009)and frame was a still image. The user was allowed to click on any object in this image using a mouse pointer. Then the color of the selected point was read as RGB values. The colors of the image were filtered out according to the selected color. Using a Color filtering algorithm it was able to filter the colors of the selected color and filled the rest of the image with black color.

After the above process, developed algorithm was able to find the blobs with same color in the image and saved each and every blob in an array sorted by the size of the blobs. Then the largest blob was selected and drawn a rectangle around largest blob to clearly point out the selected object, and calculated the X and Y coordinates of the center of the rectangle with respect to the display pane. The above scenario was repeated for every frame. Thus any object in the frame can be tracked by its color, using the above algorithm.

Universal Serial Bus (USB) communication was very important to read and write data to the external hardware. First the USB port which was used to communicated with the implemented hardware and the Software had to be configured. Once the baud rate was specified in the system, the serial port started to perform the communication. The Microcontroller attached to the serial port was programmed to read the data from the USB port, and the program run in a Computer was able to read the data from the Microcontroller via USB.

In this proposed system, two servo motors were used and initially they were set to 90 degrees. Then in tracking algorithm two variables X and Y were declared and they were used to hold the values which were going to pass to the Microcontroller. Above X and Y variables also set to 90 degrees initially. Then calculated the display pane's center X and Y coordinates. Subtracted the display pane's center X coordinates from the largest blob's center X coordinate, if the value was a negative value, and then decreased the variable value which hold the X value and wrote it to

the serial port. If the subtract value was positive increased the variable value which hold the X value and wrote it to the serial port. If it equal to 0 did nothing. With parallel to the above process, subtracted the display pane's center Y coordinates from the largest blob's center Y coordinate, if the value was negative value, and then increased the variable value which hold the Y value and wrote it to the serial port. If the subtract value was positive decreased the variable value which hold the Y value and wrote it to the serial port. If it equal to 0 did nothing. These two parallel processes executed until the program stopped inside an infinite loop. The Microcontroller was programmed to accept those two values and it was programmed to identify the X and Y values uniquely and pass correct values to relevant servo motors. This algorithm and the programmed microcontroller kept the tracked object in the center of the display pane always by rotating the camera towards the object.

Result and Discussion

The system is capable of tracking objects based on the color. Initially the video stream from the camera is load in to the application and the user clicks on an object he/she wishes to track. Then the system detects the color of the object. The image processing algorithm filters the image based on the selected color. It isolates the detected object and makes a rectangle around the selected object.

Tracking algorithm passes the values to Ardunio, which are the angles to servo motors to rotate. The algorithm in the Ardunio is capable of identifying the relevant servo motor and rotates it by the angle, which is passed by the Computer application. So the camera attached to the pan tilt mechanism which is operated by two servo motors and always focuses on an object the user point out.

Conclusions

An Object Tracking Automatic Camera able to track moving objects. It has the capability to track objects which run away from normal still camera boundaries. This system can track objects based on the color and then the camera has the facility to rotate along X and Y axis.

References

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