

Face Detection & Colour Detection Controlled WMR Using Matlab

Sarthak Bhatt, Piyush Jain

Abstract---In this paper, a system is designed to control 2-Dimensional motion of 2x2 wheeled mobile robot (WMR) through the camera capturing the colour shown by the bands wore on the finger . I fused three(one customized and 2 standard) algorithms: Viola-Jones in [1] for face detection, Colour Detection[2] to detect the colour strips attached to user's fingers and Motor synchronization algorithm to convert the detected finger band's colour into WMR's locomotion . To reduce the noise detected in each frame I designed the system in such a way that first user's face will get detected and then only system will proceed to track the colour attached to the finger. The WMR's motor controlling is performed by an Arduino platform and the Real-time Image processing [6] is implemented on a PC by using Matlab.

Keyword--- Arduino, Computer vision, finger bands, Face detection, Matlab, Object Tracking, Real-Time Image processing, wheeled Mobile Robot (WMR).

I. INTRODUCTION

The aim of this paper is to provide a wheeled mobile robot a console-less control via image processing by detecting a colour strip in the captured frame only when a face is already detected in the frame, this sequence not only helps to detect the genuine colour bands but also helps to reduce the background noises that can be arise in a captured frame. This paper is divided into two parts: Software part that deals with the algorithms to detect the specific areas, hardware part deals with the performing of locomotion's as respect to the computed track. The earlier work involve in the feild of WMR consist of the hand gesture controlled WMR [3], the controlling of WMR by finger movement using fuzzy logic[4], object tracking WMR[5] these are piece of work in this field .None of the work adopted the concept of , these method were bit inaccurate due presence of unwanted noise ,these proposed work were complicated and lack in accuracy ,due to presence of noise. So in our system in order to increase the efficiency we related the work with the face recognition and provide the locomotion to the WMR by detecting the colour of the band on finger which tend to increase the accuracy of the system and reduce the complexity.

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Hardware -Robot is divided into two parts: head which consists of an arm controlled by servo motors and a camera is attached at the tip of arm, useful to perform and finger trajectory recording; the second part is Base part that is connected with 4 D.C. motors connected to D.C. motor driver. Base part is useful to perform 2-Dimensional locomotion's. Except camera module, Base and Head are connected to the Arduino , camera module is connected to the computer as arduino cannot perform heavy computations to give robot a computer vision. Software- We used real time image processing [6] for and colour detection which can be done efficiently in Matlab. After image processing, color detected in the frame is matched from the servo-action table and the instructions are passed to microcontroller (we used arduino as a microcontroller). One more benefit that we got from Matlab is it also provide libraries for arduino to reduce extra work. Arduino fetches instructions from servo-action table and perform it on the motors attached with arduino and these actions makes the locomotion's of WMR.

II. METHODOLOGY

As we all know that there are many way by which we can control WMR, but we have implied an simple concept which work on the mechanism of and colour detection. The WMR will first follow the step of face recognition which will be helpful in the removal of the unwanted noise which will involve in colour detection as we have the colour which we will use in the band to control the WMR may exist in surrounding so to avoid our WMR detect that colour we use the concept of to remove the noise and make the WMR more accurate. The detected colour will provide the locomotion to the WMR, as we have assign the different colour for different

direction motion so by indicating that colour by our finger band we can guide the locomotion

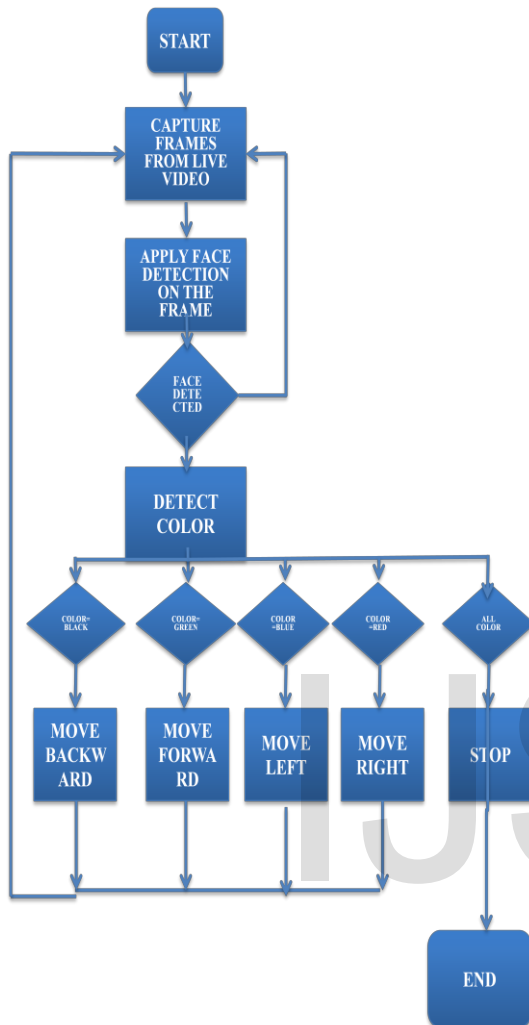


Fig 1. Working flow chart

There are three step involve in the methodology-

1. IMAGE PROCESSING

The image processing [7] is the main method which will involve face recognition [1] and the color detection[2] using MATLAB. The face recognition involve the use of viola Jones algorithm and the training of the system by providing the data set of face, the viola Jones is a inbuilt algorithm in Matlab for the ,by using the viola Jones algorithm we detect and recognize the face ,the recognition take place by training the system with the data set, then the system will detect the face and the process of processing shift to new step. The next involve step is of colour detection the system will only detect the colour of the band placed in our finger as we have coded

the system in such a way that it will check for the colour of our finger along with the band on our finger so as to increase the accuracy of colour detection and provide the desired locomotion .The finger detection along with the colour detection of band will remove the more noise.

2. ARDUINO INTERFACING WITH MATLAB

The interfacing the matlab with the arduino board[8] is essential as because without the interaction the motion of WMR is not possible, the arduino board is the microcontroller which help in executing the direction given by the system on the WMR so the WMR give the desired locomotion. We perform the interfacing by the use of code and the matlab has a inbuilt library for the arduino or you can say real time hardware interfacing, by using this library we make the desired interfacing and writing the name of com port for serial communication in the serial communication code. The com ports interface the arduino with the system.

3. LOCOMTION MECHANISM

The locomotion of the WMR is our desired output, the locomotion mechanism consist of motor the motion of motor govern by the arduino board coding. The locomotion system gives the desired output on the basis of the colour detected by the system.

The locomotion shown by the system for given colour detectio are-

COLOR	MOTOR-ACTION
RED	RIGHT
GREEN	FORWARD
BLUE	LEFT
BLACK	BACKWARD

III. PROPOSED SCENARIO

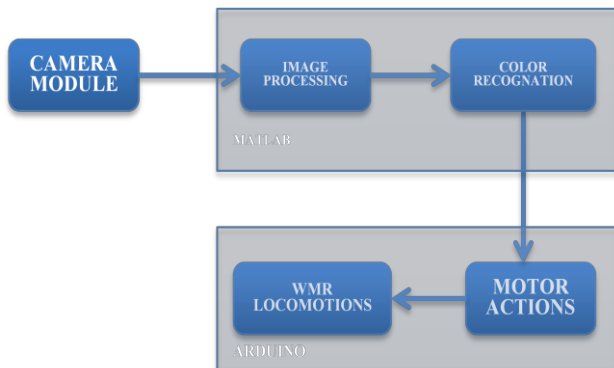


Fig 2. Proposed Model

In this model, we attached a camera module in the WMR and set direct connection between computer and camera so that Matlab can access video directly and divide live video into frames. These frames will further send to image processing stage where our algorithm first will detect a face from particular frame and then only it will proceed for the color recognition phase. In color recognition phase, frame which were passed by image processing stage will get computed to detect color and get matched to the motor actions. Both of these phase will be computed on Matlab.

In motor actions phase, colors recognized from the previous phase will be converted according to their respective motor actions. To perform motor action we used Arduino as a microcontroller and we attach 4 DC motors with Arduino for the locomotion of WMR.

IV. CONCLUSION

In this work we made a WMR whose locomotion depend upon the output given by the system i.e. the result of the image processing mechanism involve in it. The WMR will give the desired locomotion as it is indicated by the colour band on the finger. The system is made more accurate then the existing system by involving the face detection before detecting the colour on band along with the finger detection, to avoid the unwanted colour noise.

This paper can be the advent of console-less control over WMR and other robots even we can add gestures to control WMR and rotate WMR in

desired direction and we can also improve human robot interaction by implementing gesture reading into this concept. By the use of this concept is there will be no use for pressing several keys in a remote controller, just give a gesture and its done.

V. REFERENCES

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