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Detection of Sudden Pedestrian Crossings for Driving Assistance Systems

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Abstract

In this paper, Detection of Sudden Pedestrian Crossings For Driving Assistance System based on ARM is designed, in which the embedded chip and the programming techniques are adopted. The central monitor which adopts S3C2440 chip as controller is the core of the whole system. First, USB camera video images are collected by the embedded Linux system, processed, compressed and transferred by the processing chip. And then detects, only the crossing pedestrians as early as possible just as they enter the view of the mounted camera using OpenCV and maintains an alarm System to alert the Driver, and then slowly applies break system. Tests show that the presented Pedestrian detection system is reliable and stable. And it has a perfect application prospects with real-time.

Keywords: Video Capture, S3C2440A, Embedded Linux, DC Motor.

I.INTRODUCTION

The main aim of this system is to design DETECTION OF SUDDEN PEDESTRIAN CROSSINGS FOR DRIVING ASSISTANCE SYSTEMS**.** We are aware of the problem of detecting sudden pedestrian crossings to assist drivers in avoiding accidents. In this embedded system, the application has two major requirements: to detect crossing pedestrians as early as possible, just as they enter the view of the car-mounted camera and to maintain alarm System to alert the Driver. In this System using ARM 32 bit Microcontroller has feature of image/video processing by using various features and classification algorithms have been used for pedestrian detection. It

overcomes the performance in terms of sensors and hardware cost is also too high. So, our design Embedded system that detects partially visible pedestrians just as they enter the camera view, with low false alarm rate and high speed.

This system takes capture image by means of web camera connected to ARM microcontroller through USB and the image is processed by using image processing technique. Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. When any pedestrian is detected it alerts driver by providing alarm sound and also it stops vehicle automatically. The display unit in vehicle provides clear details at position it detects pedestrian either right or left.

In this system we are going use S3C2440 based microcontroller, which the current dominant microcontroller in mobile based products.

II. HARDWARE SYSTEM DESIGN

The hardware system includes processor, USB Camera, Stepper Motor, and a Buzzer to make an alert signal. In this paper SAMSUNG S3C2440 [2] ARM9 processor is chosen to complete the core control; Logitech CMOS camera is used as a video-capture. As shown in Figure 1, block diagram of the hardware system design.
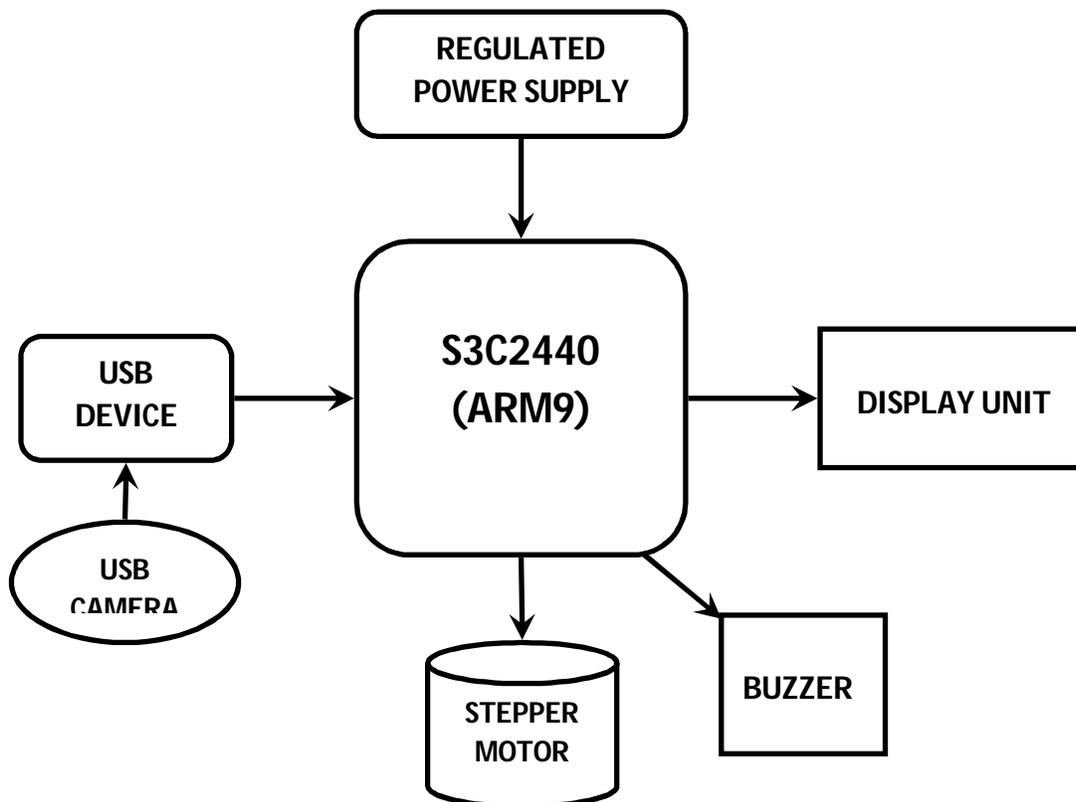

Figure 1.Block diagram of the hardware system design.

2.1 SAMSUNG S3C2440 Processor

. S3C2440A microcontroller [1]. As shown the block diagram in Fig 1. We use the latest SAMSUNG's S3C2440A. Its low power, simple, elegant and fully static design is particularly suitable for cost- and power-sensitive applications. It adopts a new bus architecture known as Advanced Micro controller Bus Architecture (AMBA). The S3C2440A offers outstanding features with its CPU core, a 16/32-bit ARM920T RISC processor

designed by Advanced RISC Machines, Ltd. The ARM920T implements MMU, AMBA BUS, and Harvard cache architecture with separate 16KB instruction and 16KB data caches, each with an 8-word line length. By providing a complete set of common system peripherals, the S3C2440A minimizes overall system costs and eliminates the need to configure additional components. Mini2440 have two flashes, one is the NOR flash, model SST39VF1601, size 2 Mbytes.

The other is the NAND flash, model K9F1208, size 64 Mbytes. S3C2440 [1]support both flash to start the department of EC, by DIP switch S2, you can choose from NAND or NOR for your system. Most of the actual products using a NAND flash chip are enough, because we learn for the convenience of users, it also retains the NOR flash. NAND flash does not have the address line, it has a dedicated control interface connected with the CPU, for the 8-bit data bus, but this does not mean that NAND flash read and write data will be very slow. Most of the USB or SD cards are made of NAND flash equipment.

2.2. USB Camera

Camera with 1.3 million pixels is selected in the built system. Particularly in poor light, the speed of CMOS camera is slower, but its price very low, and CMOS has power consumption only when the circuit is connected, it is generally used low-end cameras, digital cameras and toys. There is a 20P plug with 2mm pitch in ARM used as extension to connect the camera. This web camera continuously monitors the room and sends the video.

2.3 DC MOTOR AND DRIVER IC

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

2.4 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

III.SOFTWARE DESIGN

The system selected Linux operating system [3][4] as software platform, the code for the application is developed using QTCreater Software in C++ language and the main functions are Capturing the image, Processing the image to find whether detected image is human ,or not Using openCV libraries, an alarm system and then slowly applying breaks to stop the vehicle.
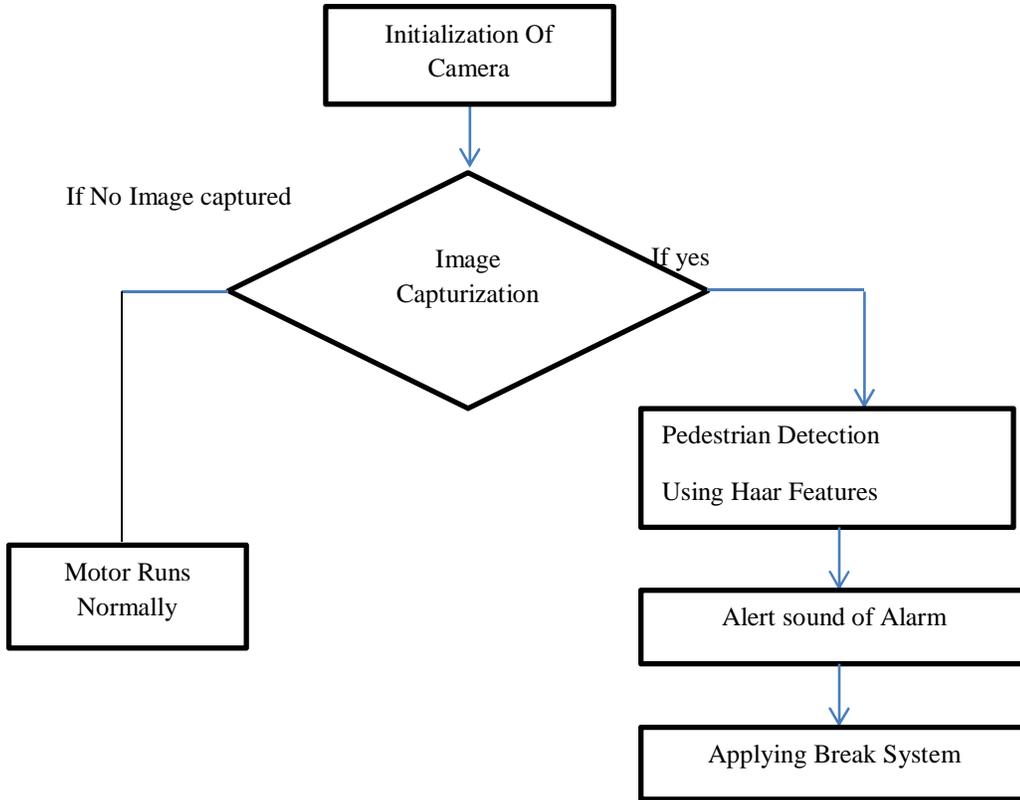
Figure 2: Flow chart of software system

3.1 Video capture module

Video Capture Based Video4Linux Video4Linux (referred to as "V4L") [1][5] is a Linux kernel on the video device driver, which is for video equipment, application programming interface functions to provide a system. The basic process of video capture shown in Figure 3. V4L USB camera using the programming on the need to use Linux system calls the next two, respectively, ioctl () and mmap ().

Application to get the camera image data collected in two ways, namely read() (method of direct reading) and mmap() (memory mapping method). mmap() system call allows processes mapping the same file through memory sharing achieved, the advantages of high efficiency, because the process can directly read and write memory, copy any data without the need to speed up the I / O access, the system is Using this method.

3.2 QT Creator

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface and also used for developing non-GUI programs such as command-line tools and consoles for servers. Qt uses standard C++ but makes extensive use of a special code generator together with several macros to enrich the language. Qt can also be used in several other programming languages via language bindings. It runs on the major desktop platforms and some of the mobile platforms. It has extensive internationalization support. Non-GUI features include SQL database access, XML parsing; thread management, network support, and a unified cross-platform application programming interface (API) for file handling.

3.4 OpenCV

Computer vision is a rapidly growing field, partly as a result of both cheaper and more capable cameras, partly because of affordable processing power, and partly because vision algorithms are starting to mature. OpenCV itself has played a role in the growth of computer vision by enabling thousands of people to do more productive

work in vision. With its focus on real-time vision, OpenCV helps students and professionals efficiently implement projects and jump-start research by providing them with a computer vision and machine learning infrastructure that was previously available only in a few mature research labs. The purpose of this text is to: Better document OpenCV—detail what function calling conventions really mean and how to use them correctly. Rapidly give the reader an intuitive understanding of how the vision algorithms work. Give the reader some sense of what algorithm to use and when to use it.Give the reader a boost in implementing computer vision and machine learning algorithms by providing many working coded examples to start from.

3.5 Detection Of Pedestrians using Haar-like features

This paper describes a vision-based pedestrian detection system using Haar-like features. Pedestrian detection in cluttered environment is an open problem. The major difficulties lie in[4]:The size, color and style of pedestrian clothing are very diverse, which causes the different appearance of same pedestrian .A Pedestrian is a non-rigid body. In other words, the shape and size of a pedestrian varies greatly, and therefore the model of a pedestrian is much more complex than that of rigid objects. The clutter background. It does not matter if we are analyzing images from a typical city or from a country traffic environment the background formed by vehicles, trees, wire poles, and billboards is very cluttered. Hundreds of features are used in a real and robust classifier.

Can a simple feature (i.e. a value) indicate the existence of a face? .All faces share some similar properties; the eyes region is darker than the upper-cheeks. The nose bridge region is brighter than the eyes. That is useful domain knowledge
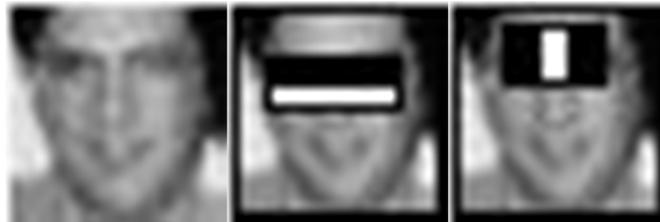
Adaboost Constructs a "strong" classifier as a linear combination of weighted simple "weak" classifiers.

$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \ldots$$

Initially, all the weights are set equally,

Repeat T times

Step 1: choose the most efficient weak classifier that will be a component of the final strong classifier

Step 2: Update the weights to emphasize the examples which were incorrectly classified

Final (strong) classifier is a weighted combination of the T "weak" classifiers
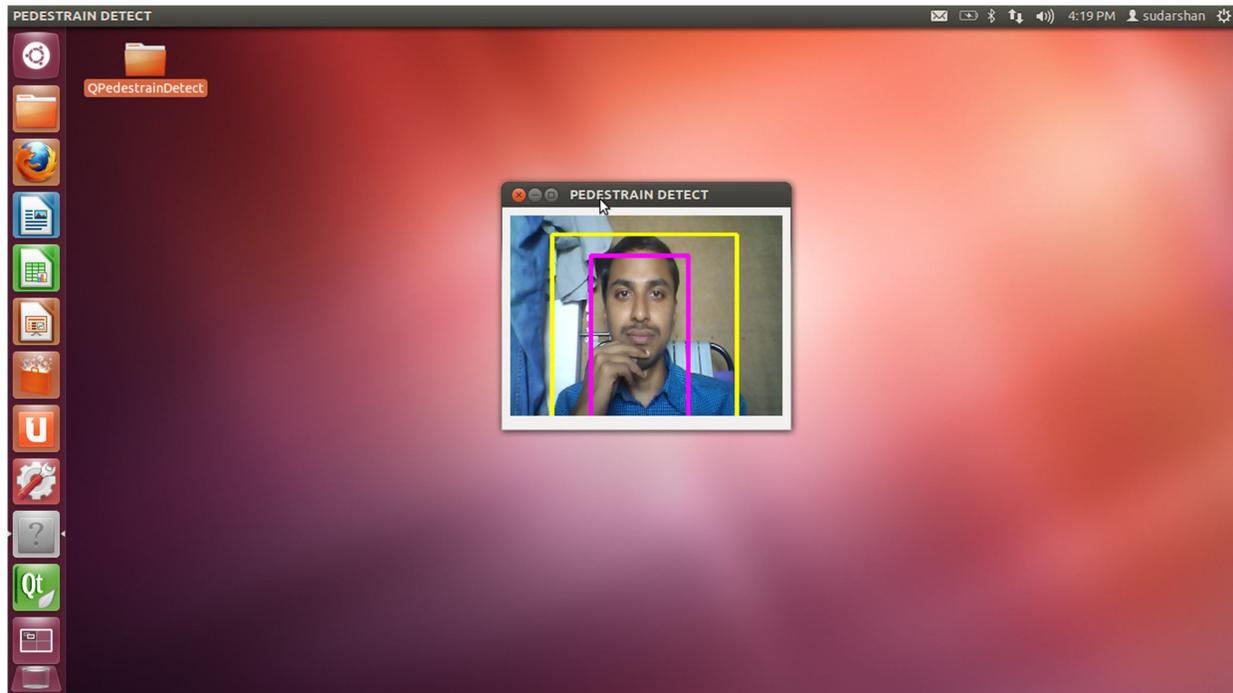
Weighted according to their accuracy

$$h(x) = \begin{cases} 1 & \sum_{t=1}^{T} \alpha_t h_t(x) \geq \frac{1}{2} \sum_{t=1}^{T} \alpha_t \\ 0 & otherwise \end{cases}$$
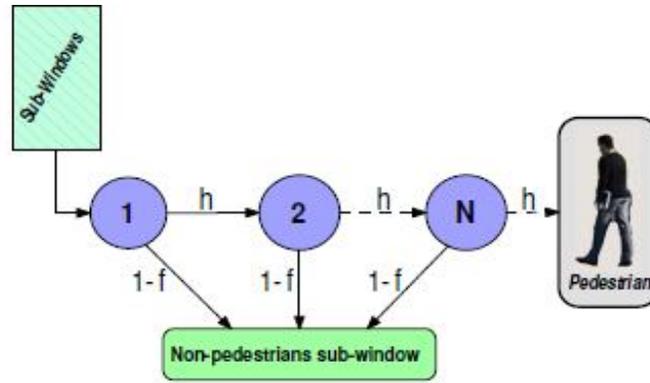
Experimental Results:

Here in the result only human being is detected but not any object. It justifies the title of the paper " Sudden Pedestrian Detection"

IV. CONCLUSION AND FUTURE SCOPE

In this paper, The project detection of sudden pedestrian detection for driving assistance systems has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working. Secondly, using highly advanced ARM9 board and with the help of growing technology the project has been successfully implemented. Here we are giving alert warning through buzzer. In future we can give alert message through voice commands from the board itself.

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