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Human Tracking System using Beagle Board -xM

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Abstract

The main aim of this project is to implement a human tracking system on both Intel based PC platform and embedded systems to optimize the algorithms for high performance. The ability to reliably detect and track human motion is a useful tool for higher-level applications that rely on visual input. Interacting with humans and understanding their activities are at the core of many problems in intelligent systems, such as human-computer interaction and robotics. An algorithm for human motion detection digests high-bandwidth video into a compact description of the human presence in that scene. This high-level description can then be put to use in other applications. Some examples of applications that could be realized with reliable human motion detection and tracking are below.

INTRODUCTION

Automated surveillance for security-conscious venues such as airports, casinos, museums, and government installations: Intelligent software could monitor security cameras and detect suspicious behavior. Furthermore, human operators could search archived video for classes of activity that they specify without requiring manual viewing of each sequence [1][10]. Having automated surveillance vastly increases the productivity of the human operator and increases coverage of the surveillance [2][3]. Automatic motion capture for film and television: Producing computer-generated imagery of realistic motion currently requires the use of a motion-capture system that stores the exact 2-D or 3-D motion of a human body using visual or radio markers attached to each limb of an actor[2][4][11]. With accurate algorithms for human motion tracking, the same data could be acquired from any video without any additional equipment. Currently, no algorithm exists that can perform human motion detection reliably and efficiently enough for the above applications to be realized. Although the problem as a whole remains unsolved, many of the tools necessary for a robust algorithm have been developed [5][6]. By assembling these task-specific tools into a working system, this thesis will show that a robust system is not far from realization [6].

PROBLEM STATEMENT

The protection of critical transportation assets and infrastructure is an important topic these days. Transportation assets such as bridges, overpasses, dams and tunnels are vulnerable to attacks. In addition, facilities such as chemical storage, office complexes and laboratories can become targets. Many of these facilities exist in areas of high pedestrian traffic, making them accessible to attack, while making the monitoring of the facilities difficult. In this research, we develop components of an automated, “smart video” system to track pedestrians and detect situations where people may be in peril, as well as suspicious motion or activities at or near critical transportation assets. The software tracks individual pedestrians as they pass through the field of vision of the camera, and uses vision algorithms to classify the motion and activities of each pedestrian. In future applications, this system could alert authorities if a pedestrian displays suspicious behavior such as: entering a “secure area,” running or moving erratically, loitering or moving against traffic, or dropping a bag or other item. The problem of using vision to track and understand the behavior of human beings is a very important one. It has applications in the areas of human-computer interaction, user interface design, robot learning, and surveillance, among others. At its highest level, this problem addresses recognizing human behavior and understanding intent and motive from observations alone. This is a difficult task, even for humans to perform, and misinterpretations are common. In the area of surveillance, automated systems to observe pedestrian traffic areas and detect dangerous action are becoming important. Many such areas currently have surveillance cameras in place, however, all of the image understanding and risk detection is left to human security personnel. This type of observation task is not well suited to humans, as it requires careful concentration over long periods of time. Therefore, there is clear motivation to develop automated intelligent vision-based monitoring systems that can aid a human user in the process of risk detection and analysis. A great deal of work has been done in this area.

PROPOSED SYSTEM

To increase the performance and use the available resources to speed up the computation in DM3730 Beagle BoardxM processor, OpenCV algorithms is used. The Embedded platform selected is the Beagle Board-xM which runs at 1GHz DM3730 processor from TI and has 512 MB of LPDDR RAM POP memory. It has asymmetric dual-core architecture with an ARM [8] [9] Cortex-A8 and TMS320DMC64X+ DSP. It is suggesting that by exploiting all the available on chip hardware resources for example ARM NEON technology to accelerate the calculation of the floating point in image processing. Moreover, fully utilize the DSP core by off load the intensive calculate from the ARM processor can shorten the execution time. Input image taken from a web cam. A webcam is a video camera that feeds its image in real time to computer or computer network. Unlike an IP camera (which uses a direct connection using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable.

OBJECTIVES OF THE PROJECT

We are living in the Embedded World. The minds of many people the image of a mainframe, a minicomputer, a PC, a workstation or a laptop computer. However, computers have always been embedded into all sorts of everyday items from automobiles and planes to TVs, in-house entertainment centers and toasters. These are usually called embedded computers or embedded systems, and actually account for more than 90% of all the world's manufactured processors. In general, users of embedded systems see a specialized function (such as a High-Definition TV) and do not directly think of the computer embedded within the system. Such embedded computers are gaining importance as an increasing number of systems use embedded processors, RAM, disk drives, and networks. Embedded systems range in size from simple toasters and mini-robots to large-scale systems deployed in process control, manufacturing, power generation, defense systems, telecommunication systems, automotive systems, air traffic control, avionics, and video-on-demand and video-conferencing systems. Beagle Board-xM is an efficient processor which is a combination of ARM Cortex-A8 and TMS320DMC64X+ Digital Signal Processor (DSP). It works with an operating voltage of 5V, In this project we enabled USB Camera with USB host to given an input to the BeagleBoard-xM processor. The operation of BeagleBoard-xM processor is to compress and quality image for determining any motion of camera field of view, and displayed on monitor. These monitor is connected to the DVI-D port of BeagleBoard-xM processor. In this project, we implemented a human tracking system and ported to an embedded platform. The system is able to track the human across the camera field of view by comparing the human color histogram in consecutive frame. The selected non embedded platform is the Intel Duo Core processor with 2.13GHz clock and 4 GB of memory. The embedded platform selected is the BeagleBoard-xM which running at 1GHz DM3730 processor from TI and has 512 MB of LPDDR RAM POP memory. It has asymmetric dual-core architecture with an ARM Cortex-A8 and TMS320DMC64X+ Digital Signal Processor (DSP).Recently; researcher has benchmarked and optimized their computer vision algorithms in FPGA platform and Digital Signal Processor platform. To increase the performance and use the available resources to speed up the computation in DM3730 BeagleBoard-xM processor, OpenCV algorithms is used. OpenCV [7] is an open source computer vision library developed by Intel Corporation.

Hardware Description Over View Of Block Diagram

Beagle Board-xM is an efficient processor which is a combination of ARM Cortex-A8 and TMS320DMC64X+ Digital Signal Processor (DSP). It works with an operating voltage of 5V, In this project we enabled USB Camera with USB host to given an input to the Beagle Board-xM processor. The operation of BeagleBoard-xM processor is to compress and quality image for determining any motion of camera field of view, and displayed on monitor. These monitor is connected to the DVI-D port of Beagle Board-xM processor.

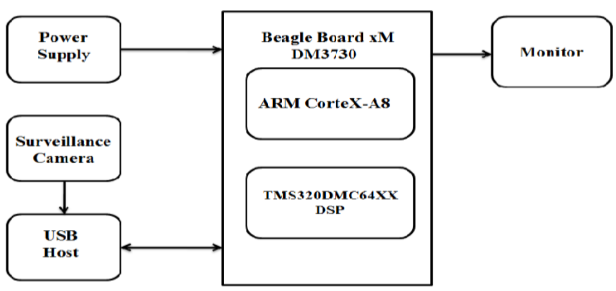

Figure: Block Diagram of Human tracking system

Beagleboard Overview

The Beagle Board is designed specifically to address the Open source Community. It has been equipped with a minimum set of features to allow the user to experience the power of the processor and is not intended as a full development platform as many of the features and interfaces supplied by the processor are not accessible from the Beagle Board. By utilizing standard interfaces, the Beagle Board is highly extensible to add many features and interfaces. It is not intended for use in end products. All of the design information is freely available and can be used as the basis for a product. Beagle Boards will not be sold for use in any product as this hampers the ability to get the boards to as many community members as possible and to grow the community

There are two different versions of the beagle in production, the Beagle Board and the Beagle Board–Xm

Beagleboard-Xm Specification

This section covers the specifications of the BeagleBoard-xM and provides a high level description of the major components and interfaces that make up the BeagleBoard-xM

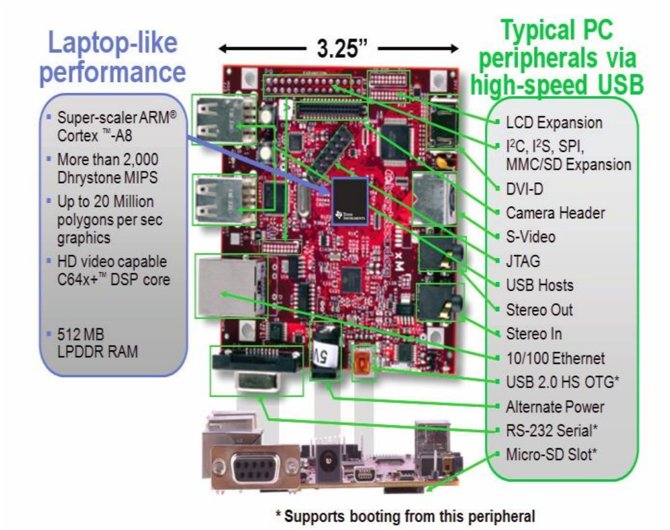

Figure: Beagle Board xM Block Diagram

Software Description Ubuntu

Ubuntu is built on the foundation of Linux, which is a member of the Unix family. Unix is one of the oldest types of operating systems and has provided reliability and security in professional applications for almost half a century. Many servers around the world that store data for popular websites (such as YouTube and Google) run some variant of a UNIX system.

RESULT

HARDWARE KIT OF BEAGLEBOARD XM :

Figure: Hardware Kit of Beagle board-xM

The above fig: specifies hardware representation of Beagle board-xM,

Figure: Hardware Kit of Beagleboard-xM with Camera

The above fig: shows when camera is connected to Beagleboard-xM,

Figure: Beagleboard-xM along with all connections

The above fig shows when all connections(keyboard, mouse, monitor) are given and when power is ON.

PC MONITOR :

Figure: To display the console of users

Figure: To display the user name

Figure: Console of authentication

As shown in above figures It specifies whenever we enable the kit the monitor asks for authentication of specified user and the user need to be give his user name and password.

INITIALIZING CAMERA

Figure: Screen representation of PC monitor

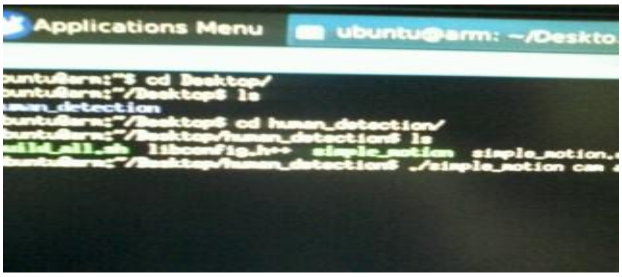

Figure: Initializing camera commands to in command prompt

The above figures Specifies initialization of USB camera that we need to give commands in command prompt.

The below steps shows the initialization commands for enabling USB Camera.

Step 1: Open command prompt

Step 2: In the present working directory type "cd Desktop/" and press ENTER.

Step 3: Now enter the command "cd Human_detection/" and press ENTER

Step 4: Next we will enter the command "./simple motion cam act"and press

ENTER.

Figure: Console after Initializing camera.

The above fig: specifies after initializing all commands the view of Camera field and it also displays the settings of camera like threshold, brightness, contrast etc...

OUTPUT IMAGES

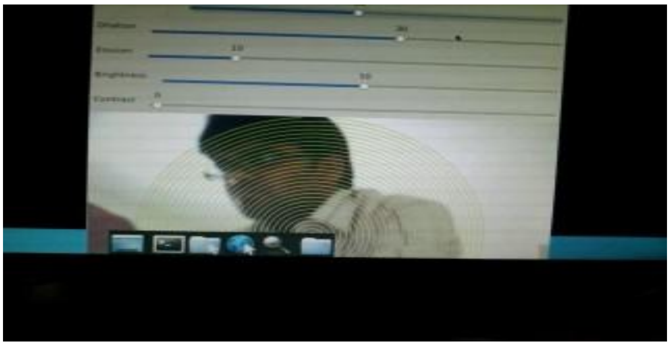

Figure: Detection of single human

As shown in fig: It's specifies and representation of output image when the single human is entered into the camera field of view, The operation of BeagleBoard-xM processor is to compress and quality image for determining any human motion of camera field of view, and displayed on monitor. Then automatically is detect a circle of background subtraction of two images, and save the resultant image.

Figure: Detection of multiple humans

The above fig: specifies background subtraction of current image (i.e. when multiple humans enter into the camera field) with the initial image and resultant image is stored in present working folder.

CONCLUSIONS

This project implemented a human tracking system on PC based and embedded platform. In this project from the results, It is suggesting that by exploiting all the available on chip hardware resources for example ARM NEON technology to accelerate the calculation of the floating point in image processing. Moreover, fully utilize the DSP core by off load the intensive calculate from the ARM processor can shorten the execution time.Tracking human motion is performed at a higher level at which the parts of the human body are not explicitly identified, the human body is considered as a whole when establishing matches between consecutive frames

FUTURE SCOPE

It can be further used as "Intelligent Digital Tracking Scopes" .Uses Cellular and GPS Technology. In addition, we believe this system would benefit from the addition of multiple cameras of different types, including a pan-tilt mounted zoom camera and an infrared camera. In the far future, we would like to examine the use of motion recognition and tracking system on a mobile robotic platform to detect and follow individuals.

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