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## Advanced Vehicle counting system from semantic regions using ARM Cortex A8

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**Abstract** —: This paper presents a novel algorithm for advance Traffic Surveillance by vehicle counting and based on the image processing theory. Vehicle counting is done by Background subtraction . A reference frame is initially used and considered as background information. While a new object enters into the frame, is detected by background subtraction. The foreground information and background information are identified using the reference frame as background model. Video sequences have been captured and tested with the proposed algorithm. .

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**Keywords**- Background subtraction, vehicle counting, semantic regions

### I. INTRODUCTION

Our project uses ARM9 micro controller. The webcam is connected to the controller through USB device. The controller processes the information and monitors the results as vehicles and no. of vehicles on remote controlled PC through Ethernet and also the information is displayed on remote pc

The increasing traffic volume over the last decades poses high challenges on today's traffic research and planning.[8]. Detection, Counting and classification of vehicles in a video has become a potential area of research due to its numerous applications to video-based intelligent transportation systems[7]. For most traffic surveillance systems, major stages are used to estimate desired traffic parameters, i.e., vehicle detection, Counting, tracking, and classification [6]. Each year, motor vehicle crashes account for about thousands deaths, more than million injuries.

Counting vehicles over a period of time on a busy intersection will help the concerned authority to efficiently control the duration of traffic signal on road thus reducing the level of traffic congestion during rush hours. It helps in minimizing the possibilities of fraudulent activities in toll collection. It is necessary to provide better traffic surveillance to reduce the accidents. So the main Goal of our paper is to provide better traffic surveillance.

For traffic surveillance application generally fixed cameras are used with respect to static background (eg:stationary surveillance camera) and a common approach of background subtraction is used to obtain an initial estimate of moving objects. First perform background modeling to yield reference model. This reference model is used in background subtraction in which each video sequence is compared against the reference model to determine possible variation. The variations between current video frames to that of the reference frame in terms of pixels signify existence of moving objects.

### II. SOFTWARE AND HARDWARE SPECIFICATIONS

#### 2.1 Software specifications

Operating System: Ubuntu

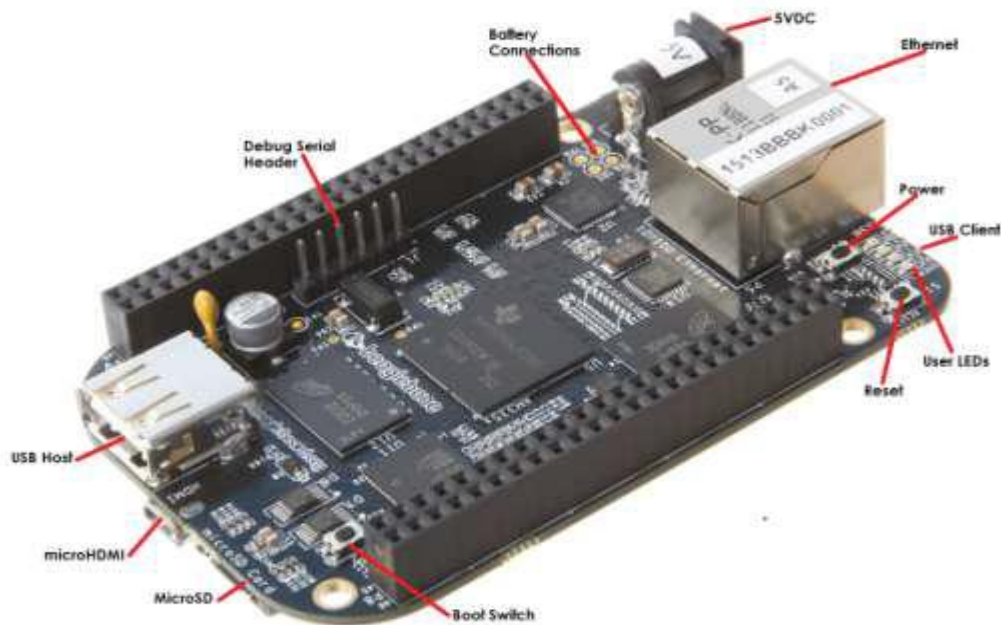
Language: C, C++

Platform: Qt and Linux-library

#### 2.2 Hardware specifications

The Beagle Bone Black is the latest addition to the BeagleBoard.org family and like its predecessors, is designed address the Open Source Community, early adopters, and anyone interested in a low cost ARM Cortex-A8 based processor For the initial release, the board uses the Sitara XAM3359AZCZ processor in the 15x15 package. This is basically the same processor as used on the original Beagle Bone. It does use the updated 2.0 revision with several fixes on this new processor as opposed to the original Beagle Bone. A couple of important features from this new processor include:

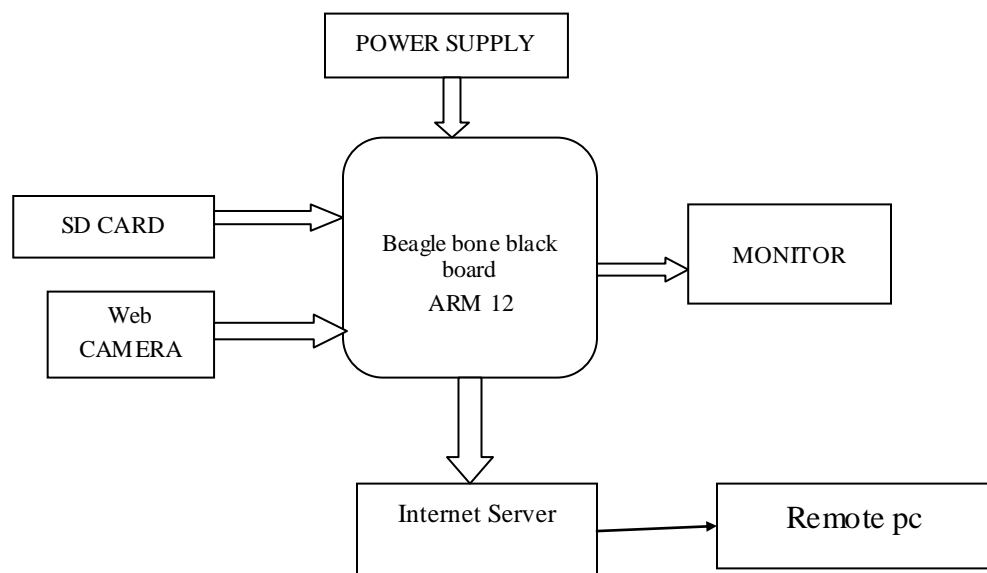
- 1GHZ Operation
- RTC fix



**Figure 1. Structure and Components of Beagle bone black Board**

### 2.3 Block Diagram description

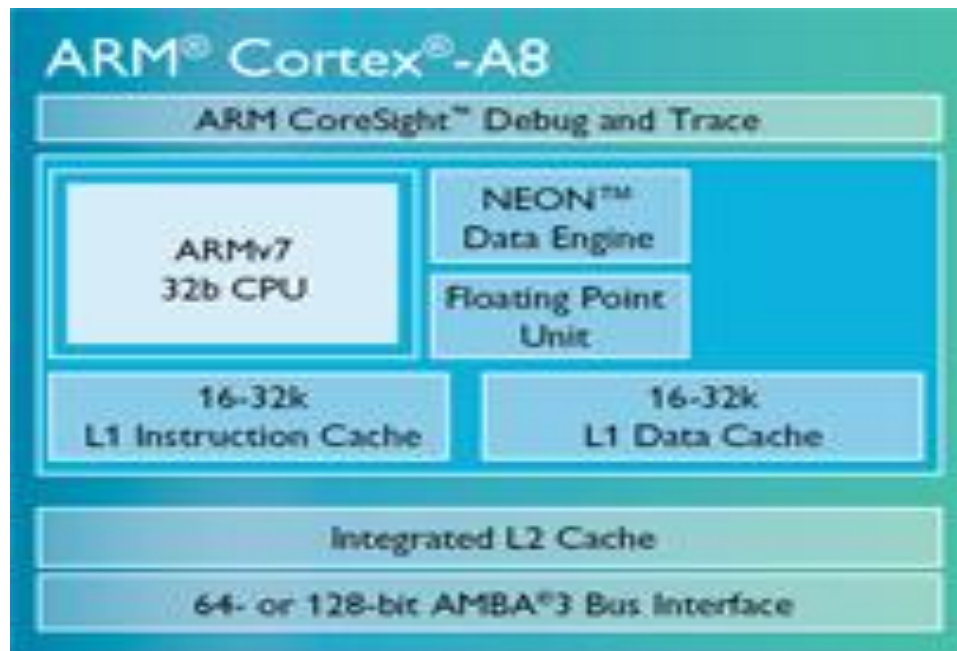
The block diagram consists of ARM12 micro controller (Sitara XAM3359AZCZ), USB cam, Power supply, Flash memory, SRAM and Earphone. The camera is connected to an ARM12 (Sitara XAM3359AZCZ) by a USB connection and it can capture the hand-held object appears in the camera view. HDMI cable is interfaced with the system to view the monitor. SRAM is used for the temporary storage and flash memory is used for the permanent storage. The ARM12 ((Sitara XAM3359AZCZ) performs the processing and provides output.



**Figure 2. Block diagram of the vehicle counting**

### 2.4 ARM Cortex-A8 (ARM 12)

The ARM Cortex-A8 processor is highly-optimized by ARM for performance and power efficiency. With the ability to scale in speed from 275MHz to 1.35GHz, the ARM Cortex-A8 processor can meet the requirements for power optimized devices with a power budget of less than 300mW and enables performance-optimized consumer applications requiring greater than 2500 Dhrystone MIPS. Compared to the ARM11 core, the Cortex-A 8 processor is a dual-issue superscalar, achieving twice the instructions executed per clock cycle at 2 DMIPS/MHz.



**Figure 3 Architecture of ARM 12**

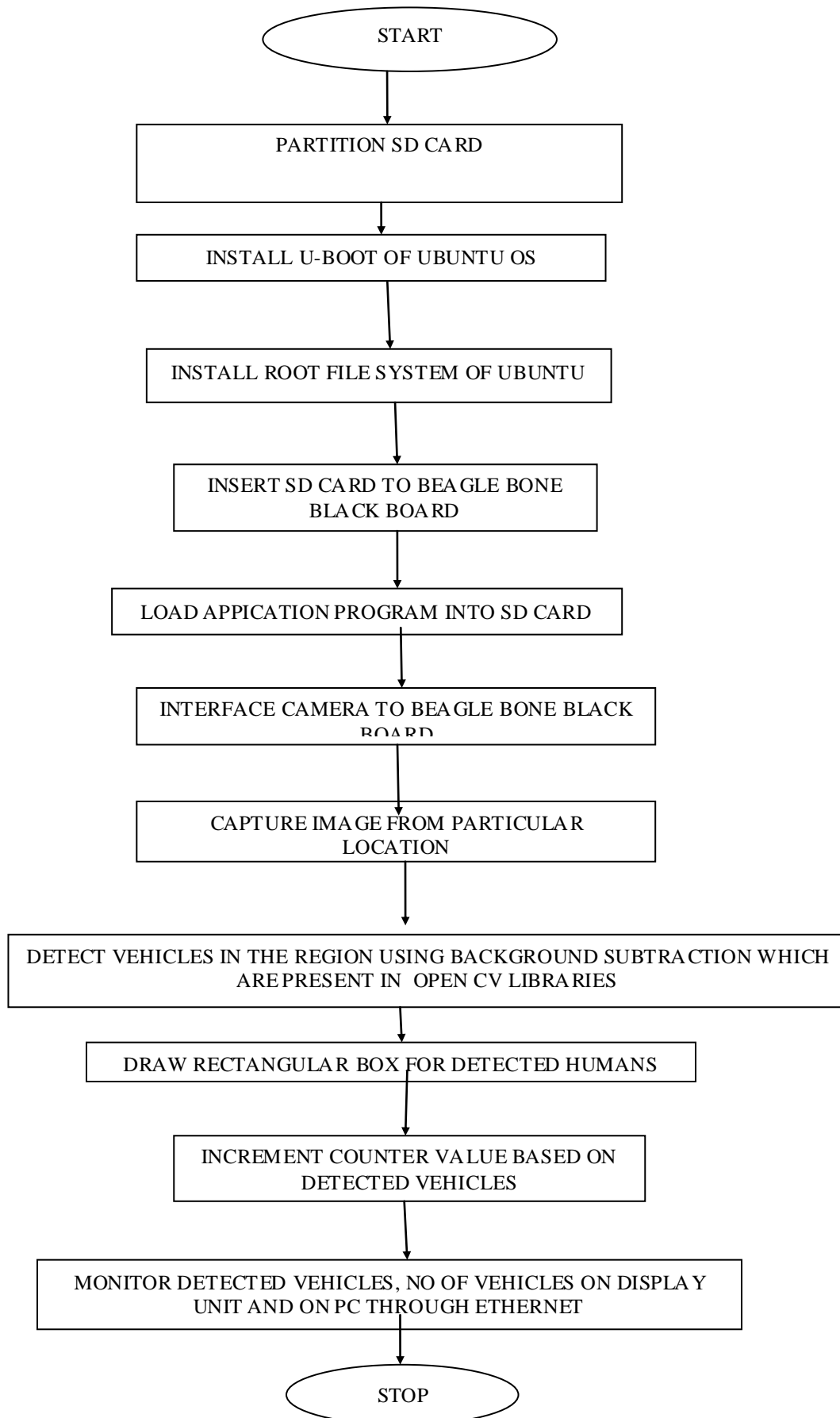
### **III. BACKGROUND SUBTRACTION**

Background subtraction is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include image denoising etc.) object localisation is required which may make use of this technique.

Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. The rationale in the approach is that of detecting the moving objects from the difference between the current frame and a reference frame, often called "background image", or "background model".

The background is assumed to be the frame at time  $t$ . This difference image would only show some intensity for the pixel locations which have changed in the two frames. Though we have seemingly removed the background, this approach will only work for cases where all foreground pixels are moving and all background pixels are static.

Background subtraction is a popular technique to segment out the interested objects in a frame. This technique involves subtracting an image that contains the object, with the previous background image that has no foreground objects of interest. The area of the image plane where there is a significant difference within these images indicates the pixel location of the moving objects [2]. These objects, which are represented by groups of pixel, are then separated from the background image by using threshold technique.



**Figure 4. flow chart of vehicle counting**

#### **IV. APPLICATIONS OF QT FRAME WORK**

Qt is available under 3 different licensing, the GNU LGPL v 2.1, GUN GPL v.3.0, and the Qt Commercial Developer License. The Qt framework is used by other widely used softwares, such as VLC media player, Virtualbox, KDE, etc.

##### **4.1.2 Technology of Qt framework**

As Qt is build on C++, it inherited most of the features of C++, like Objective Oriented Concepts, Modeling etc, but it also used special code generator, QML which is an easy to use declarative language. And with integration of the open source WebKit rendering engine into Qt, it is easier to create web-enabled applications.

##### **4.1.3 Implementation**

As Qt is based on C++, it can be easily ported on to different platforms, such as Embedded Linux, Max OS X, Windows, Linux/X11, WindowsCE, Symbian, and MeeGo. Since it is open source, it is free to use, and with a different user communities, finding tutorials and the books you need would only take less than a day. The Qt framework for embedded Linux also comes with its own window system, which writes directly to the Linux framebuffer, eliminating the need for the X11 windowing system. The Qt also comes with different IDE other than its own. It has support for Eclipse, Visual Studio, Netbean. User can choose the IDE or their choice and still use Qt for their application development.

#### **V. OPEN CV**

**Open CV (Open Source Computer Vision)** is a library of programming functions for real time computer vision. It is developed by Willow Garage, which is also the organization behind the famous Robot Operating System (ROS). Now you'd say MATLAB also can do Image Processing.

The main advantage of open cv is automatically loads and releases the memory

#### **V. CONCLUSION AND FUTURE WORK**

The project “**Advanced Vehicle counting system from semantic regions using ARM 12** ” 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 of the unit. Secondly, using highly advanced Beagle bone black board and with the help of growing technology the project has been successfully implemented.

Our system is designed to count the vehicles from schematic regions but there may be chances of wrong detection of vehicles ie the system counts the objects which are in the shape of vehicles and count may also wrong. This is the main limitation of this system.

We can overcome this limitation in future by using effective open algorithms.

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