

Hardware Implementation of Real-Time Image Segmentation Algorithms using TMS320C6713 DSP and VM3224K2 Daughter Kit

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Abstract— Digital image processing continues to enable the multimedia technology revolution that we are experiencing today. The main purpose of this project is to create a code for implementing license plate segmentation from vehicle image in various luminance conditions. The basic process involves is to take image as input from CCD camera which is to be segmented in DSP board using a very efficient segmentation algorithm based on the analysis of vertical and horizontal histogram with the edge processing methods. In this paper we have also used DSP Simulink Blocksets in MATLAB for simulation purposes and C6713 DSK, Code Composer Studio v3.1 for code developing and implementation. The segmentation technique and proposed algorithm were well implemented practically in real-time by using the floating-point processor TMS320C6713 DSP chip manufactured by Texas Instruments. VM3224K2 Daughter Kit (LCD) is embedded with DSK6713 Kit to display the output image also L2 cache memory and the compiler optimization techniques were tuned for best performance improvement.

Keywords— TMS320C6713, VM3224K2 Kit, Code Composer Studio, Segmentation, Edge Detection, Thresholding Techniques

I. INTRODUCTION

Image processing is a method to perform some operations on a digital image in order to get an enhanced image or to extract hidden information that can be interpreted and used to several purposes. Image segmentation has a promising future as the universal segmentation algorithm and has become the focus of contemporary research; it's an integral step in any image processing that some applications requires a simple division of image into homogeneous regions while others require more accurate detection, so for this reason we need a special unit like a DSP processor that we use for digital signal and image processing in real time and high-speed data transfer.

Digital signal processor is one of the core technologies in rapidly growing application that become a key component in many domains. A C6x processor can be used as a standard general-purpose digital signal processor programmed for a specific application. DSP is generally more expensive since it has more real estate. Several factors, such as cost, power consumption, and speed, come into play when choosing a DSP. The Specific-purpose digital signal processors are available with different feature, such as faster execution speed,

Digital signal processors such as the TMS320C6x family of Texas Instruments are like fast special purpose microprocessors with a specialized type of architecture and an instruction set appropriate for signal processing. All DSP techniques have been very successful because of the development of low-cost software and hardware support. TMS320C6x DSP is considered to be TI's most powerful processor for applications requiring intensive computations.

II. DIGITAL IMAGE PROCESSING

An image defined as a two-dimensional function $f(x, y)$; x and y are spatial coordinates. The amplitude of the 2D function f at any pair of coordinates (x, y) is called intensity or gray level of the image at that point. When f , x and y are all finite and discrete quantities, these elements are referred to as pixels. These amplitudes composed as a vector of data where the Color image has three components RGB at each point. License plate recognition is a type of technology, mainly software that enables computer systems to read automatically the registration number of vehicles from digital RGB images.

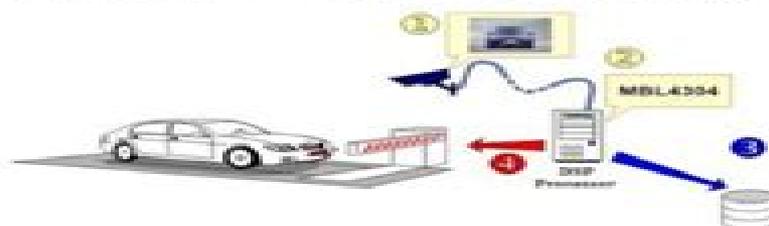


Fig. 1. Automatic Number Plate Recognition System (ANPR)

RGB image is a 3-dimensional combination of RED, BLUE and GREEN colors. In our work we have represented the input image using Y-Cb-Cr format then we displayed by converting into RGB format using the mathematical equations:

$$R = Y + 1.402 (Cr-128) \quad (1)$$

$$G = Y - 0.34414 (Cb-128) - 0.71414 (Cr-128) \quad (2)$$

$$B = Y + 1.772 (Cb-128) \quad (3)$$

Algorithms And Hardware Implementation Of Real Time

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Algorithms And Hardware Implementation Of Real Time:

Hardware Implementation of Real Time ECG Analysis Algorithms Ashish Shukla,2008 Advances in Networked-Based Information Systems Leonard Barolli,Kin Fun Li,Tomoya Enokido,Makoto Takizawa,2020-08-19 This book aims to provide the latest research findings innovative research results methods and development techniques from both theoretical and practical perspectives related to the emerging areas of information networking and their applications The networks and information systems of today are evolving rapidly There are new trends and applications in information networking such as wireless sensor networks ad hoc networks peer to peer systems vehicular networks opportunistic networks grid and cloud computing pervasive and ubiquitous computing multimedia systems security multi agent systems high speed networks and web based systems These kinds of networks need to manage the increasing number of users provide support for different services guarantee the QoS and optimize the network resources For these networks there are many research issues and challenges that should be considered and find solutions **1999 IEEE International Conference on Acoustics, Speech, and Signal Processing** ,1999 **Advances in Clean Energy Technologies** Gaurav Dwivedi,Puneet Verma,Vikas Shende,2025-04-14 This book contains select peer reviewed proceedings from the International Conference on Innovations in Clean Energy Technologies ICET 2023 It explores a variety of durable energy efficient and next generation smart green technologies aimed at promoting a sustainable future The topics covered include smart technology based products energy efficient systems solar and wind energy carbon sequestration green transportation green buildings energy materials biomass energy smart cities hydropower bio energy and fuel cells The book also discusses the performance attributes of these clean energy technologies as well as their workability and carbon footprint It is a valuable reference for beginners researchers and professionals interested in clean energy technologies **Real Time Programming 1998 (WRTP '98)** Lichen Zhang,A. H. Frigeri,Liangchi Zhang,Wolfgang A. Halang,1998 With its tradition of more than three decades the IFAC IFIP Workshop on Real Time Programming WRTP has become an excellent forum for exchanging information on recent technological advances and practices in real time computing a field that is becoming an essential enabling discipline of both control engineering and computer science and engineering As there is an accelerated growth of demands for the functionality and dependability of real time systems our intellectual and engineering abilities are being challenged to come up with practical solutions to the problems faced in the design and development of complex real time systems The Workshop on Real Time Programming provides an opportunity to assess the state of the art to present new results and to discuss possible lines of future developments Primarily it focuses on software development for real time systems and real time operating systems This 1998 Workshop covered the latest research and developments in real time communication and formal specification operating systems and performance analysis scheduling use of neural networks in real time systems embedded systems and programming methodologies Contributions came from Europe North America

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