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SCIENCE AND TECHNOLOGY

CERTIFICATE

of Apreciation

Presented to

Puspaningtyas Sanjoyo Adi

as

Participant

in The International Conference on Science and Technology (ICOSAT 2016)

"Promoting A New Innovation on Food, Energy, and Environment Sustainability Through Science and Technology for Development"

Syahida Inn,
Syarif Hidayatullah State Islamic University Jakarta,
November 16th - 17th, 2016

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ICOSAT 2016

Syahida Inn,
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Jakarta,
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ENERGY AND ENVIRONMENT

ORB Image Detection in Android

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ABSTRACT

In recent years, there has been rapid development of the technologies used in smart devices. Hence, research into these technologies is required in order to expand our understanding of these devices. One of the main features of smart devices is the mobile camera. Many studies have been conducted about how to utilizing service using camera. A key component of camera applications is image processing software. In this paper, we analyze the performance of the ORB algorithm for image detection in mobiles. We use Android applications with OpenCV library. Through this study, we find that ORB algorithm can work well for image detection in mobile applications.

Index Terms—
Feature detector, Computer vision, Image processing, ORB, OpenCV

I. INTRODUCTION

Currently the image features can be summarized as two categories: global features (such as color, texture, outline, etc.) and local features. They are used to describe global information and local details of the images respectively. A lot of experimental results show that the integrated features which combine these two kinds of features can improve recognition accuracy effectively [2].

Scale Invariant Feature Transform (SIFT) is the most representative local feature descriptor currently, which is invariant to image scale and rotation, and proven to be able to provide robust matching across a substantial range of affine distortion, variations of 3D viewpoint and illumination [3]. But the computational complexity of feature extraction is very high. Therefore, a variety of fast local feature extraction algorithms have been proposed, such as Speeded Up Robust Features (SURF)[4], Oriented FAST [7] and Rotated BRIEF [5] (ORB)[6] etc. Compared with SIFT, the extraction speed of these features are much faster than that of SIFT and they can achieve comparable performance when they are used in image classification, retrieval and other applications.

II. Computer Vision Technologies

A. ORB feature detection and descriptor matching

Currently, common feature point matching algorithms include SIFT [3], SURF [4], BRIEF [5], ORB [6]. The key factor affecting speed and accuracy of feature point matching is feature detection. There are two kinds of feature detection: descriptor based on absolute value and descriptor based on comparison. SIFT and SURF which stand for descriptor based on absolute value generally quantify gray or gradient to get a histogram, then construct descriptor based on histogram. Compared with SIFT and SURF, BRIEF and ORB based on comparison have great advantage. They construct the descriptor by comparing the characteristic value which is pre-trained or belongs to random points. This kind of descriptor is designed to improve speed. As can be seen from [5] and [6], it takes respectively 5228.7 (ms), 217.3 (ms), 8.87 (ms), and 15.3 (ms) for SIFT, SURF, BRIEF-32 and ORB to process one frame. Compared with ORB, BRIEF is faster but it do not have the rotation invariance. When people use the smart phone, the change of rotation and position is relatively frequent. So BRIEF is not suitable for feature point matching for smart phone. ORB is proposed based on BRIEF. It has rotation invariance because of adding a direction variance to each descriptor. So this paper chooses ORB descriptor.

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OpenCV (Open Source Computer Vision Library) is released under a BSD license and hence it is free for both academic and commercial use [1]. It has C++, C, Python and Java interfaces, and supports Windows, Linux, Mac OS, iOS and Android operating systems. OpenCV is designed for computational efficiency, with a strong focus on real-time applications. Since it is written in optimized C/C++, the library can take advantage of multi-core processing. Also, it supports low-level and high-level APIs (Application Programming Interfaces), and is suitable for real-time applications. OpenCV has a modular structure, which means that the package includes several shared or static libraries. The following modules are available:

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In order to improve development efficiency, we choose to do with OpenCV. OpenCV is an open source computer vision library, and it implements many common algorithms of image processing and computer vision. OpenCV provides two kind of interface, C++ and Java, the

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We simulate an ORB algorithm based on the Android operating system in real-time camera. The flowchart of object detection process is shown in figure 1. At first, reference image is saved in application and application will compute and get key point extractor and its descriptor. Application will reference image descriptor. We use ORB key point extractor and descriptor. After that, video picture is taken from smart phone camera. Application will get a sample video frame as scene image. ORB algorithm calculates key point and descriptor. Furthermore, the application will calculate the level of accuracy (matching) or descriptor matcher between two descriptors, reference descriptor and scene descriptor. The calculation result is a list of list of a couple of key points reference image and scene image along with the distance between keypoint. Furthermore, the application will find good key point with the steps: 1) calculate the minimum distance of all couples are formed. 2) find a couple keypoint within less than 1.5 times the minimum distance. Couple this keypoint hereinafter referred to as good key point. Furthermore, the application will calculate homografi with the input parameter is a good key point and the key point of the scene image. Homografi calculation will result in recognition status outputs reference image, known or not. If recognized, then the application will draw a box poses as a sign that the reference image is recognized on the scene image.

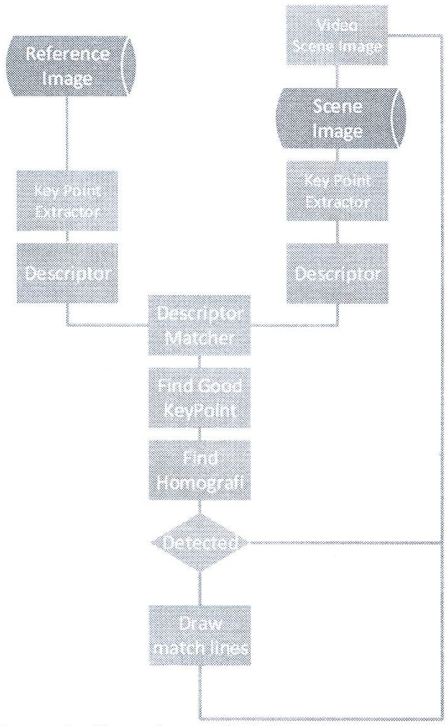

Figure 1. flowchart of object detection process

The Android application is designed based on the class diagram shown in Figure 2. `MainActivity` class is the main class in android application. `MainActivity` class implements the interface `CvCameraViewListener2`. This interface is the interface of the package OpenCV. This interface provides three functions: `onCameraFrame ()`, `onCameraViewStarted ()`, `onCameraViewStopped ()`. `OnCameraFrame()` is a

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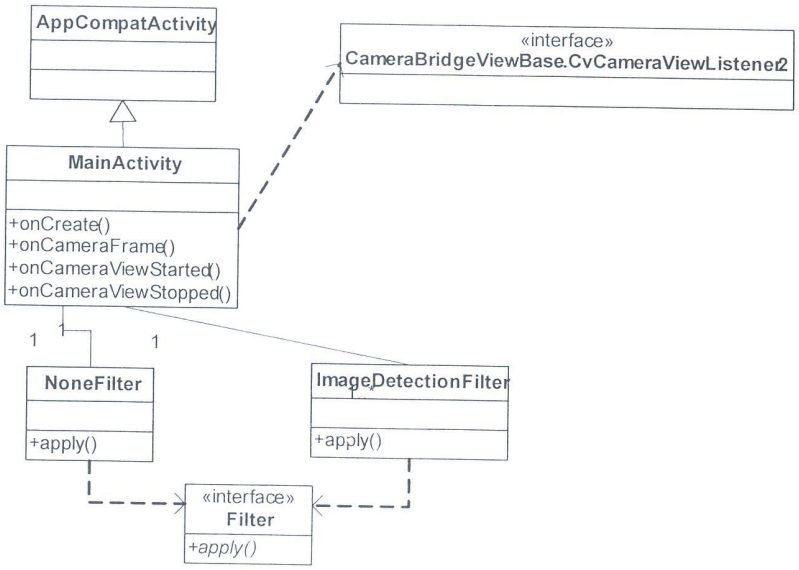

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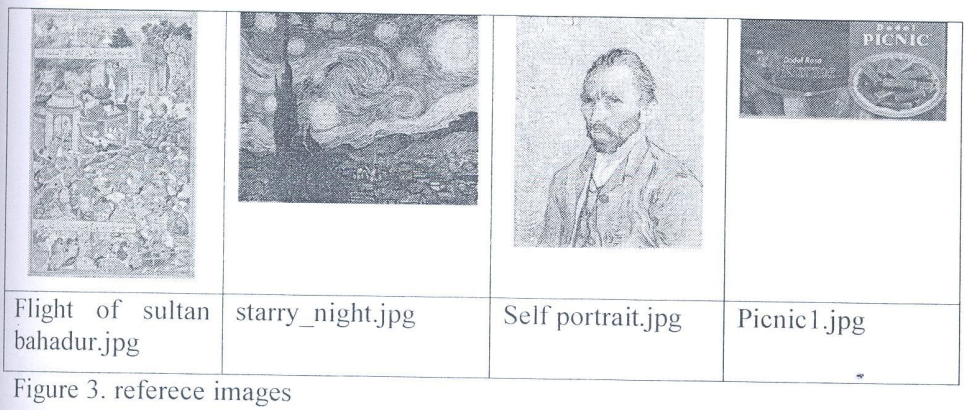

Flight of sultan bahadur.jpg	starry_night.jpg	Self portrait.jpg	Picnic1.jpg

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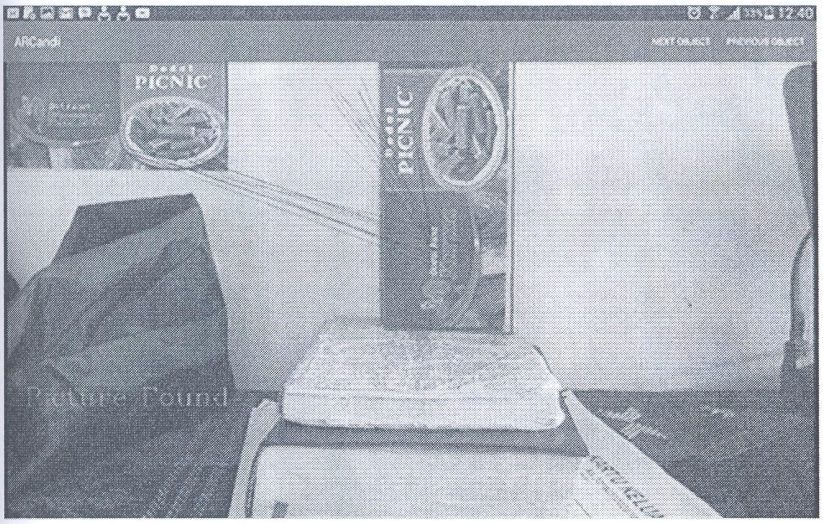

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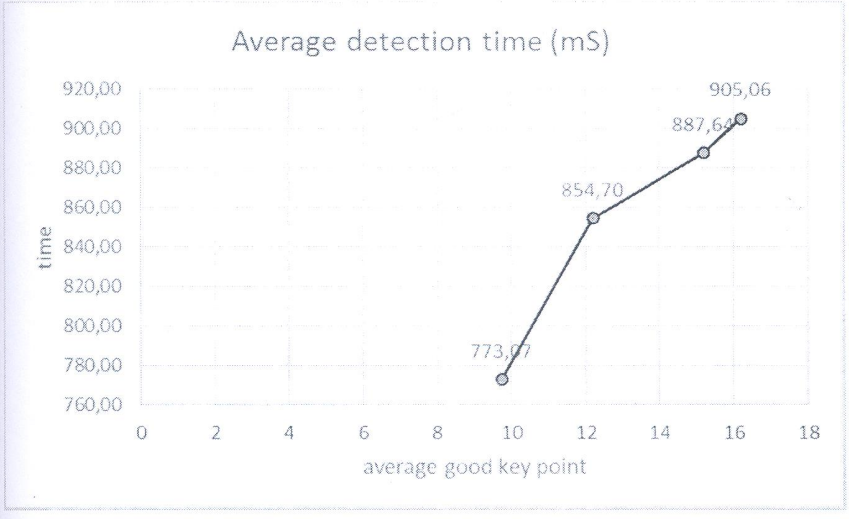

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Acknowledgment

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SURAT TUGAS

Nomor: 113/DKN/FST/ST/XI/2016

Pimpinan Fakultas Sains dan Teknologi Universitas Sanata Dharma Yogyakarta dengan ini memberikan tugas kepada:

N a m a	:	1. Puspaningtyas Sanjoyo Adi, S.T.,M.T. 2. Sri Hartati Wijono, S.Si.,M.Kom.
Pekerjaan/Jabatan	:	Dosen Prodi Teknik Informatika
Unit Organisasi	:	Fakultas Sains dan Teknologi Universitas Sanata Dharma
A l a m a t	:	Kampus III Paingan , Maguwoharjo,Depok, Sleman Yogyakarta Telp. (0274) 883037, Fax. (0274) 886529
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Waktu	:	Rabu - Kamis, 16 - 17 November 2016
Biaya	:	Dana Penelitian DIKTI

Tugas ini harap dilaksanakan sebaik-baiknya, dan apabila sudah selesai agar segera memberikan laporan.

Yogyakarta, 14 November 2016
Dekan,

Sudi Mungkasi, S.Si.,M.Math.Sc.,Ph.D.

Yang bersangkutan telah melaksanakan tugas dengan baik sesuai waktu yang tertera dalam surat tugas.

Jakarta, 16 November 2016

(Dr. Cicatwati, Ir. MP)
Jabatan: Waki Dekan Bidang Akademik

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Email : fst@uinjkt.ac.id
Website : fst.uinjkt.ac.id

Ref. No : Un.01/F9/HM.00.5/ 9820 /2016

Date : Oct 19, 2016

Subject : **Notification of Acceptance for The International Conference on Science and Technology (ICOSAT)**

Dear Puspaningtyas Sanjoyo Adi and Sri Hartati Wijono,

I am writing on behalf of committee of International Conference on Science and Technology (ICOSAT) 2016. Your abstract entitled "**ORB Image Detection in Android**" has been accepted for oral presentation at International Conference on Science and Technology (ICOSAT) that will be held on November 16-17, 2016 at Syahida inn 6th floor, Kertamukti street No. 5 Ciputat, Kampus II Syarif Hidayatullah State Islamic University Jakarta, Indonesia

You should submit your full paper by November 10, 2016. The paper will be published in the conference proceedings and selected papers will be published in an International Journal indexed by Scopus. Schedules and further information will be informed by email.

Yours Sincerely,

Dr. Elpawati, Ir. MP
NIP. 19641204 199203 2 001
Vice Dean of Academic Affairs

Cc:
Dean Faculty of Science and Technology

ORB Image Detection in Android

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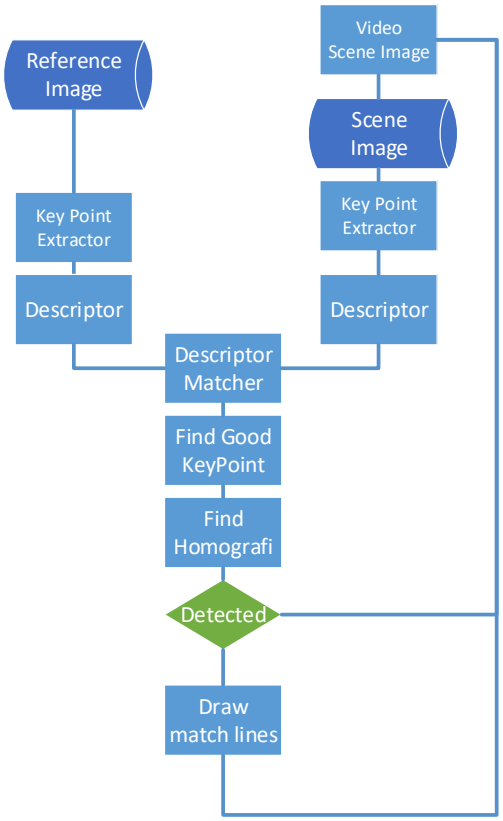

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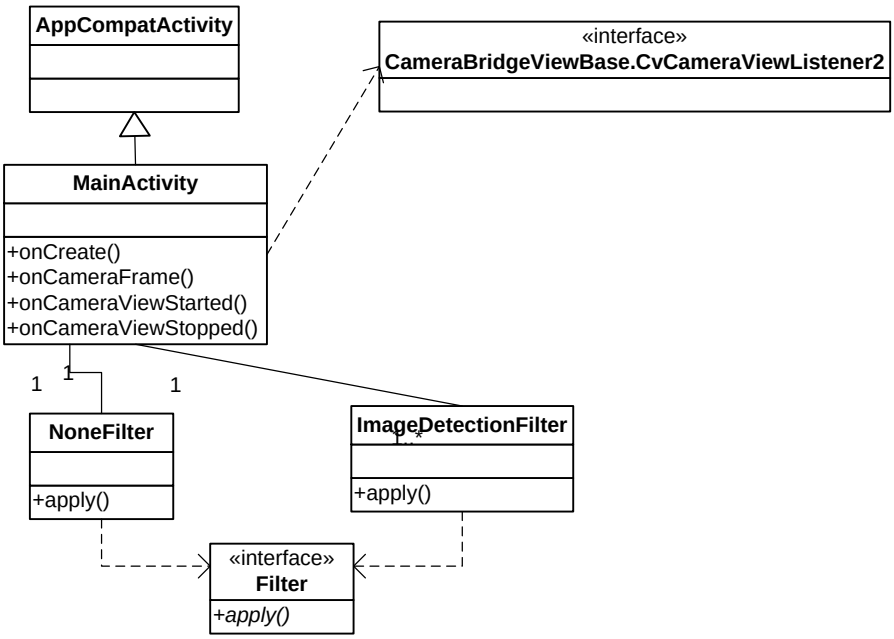

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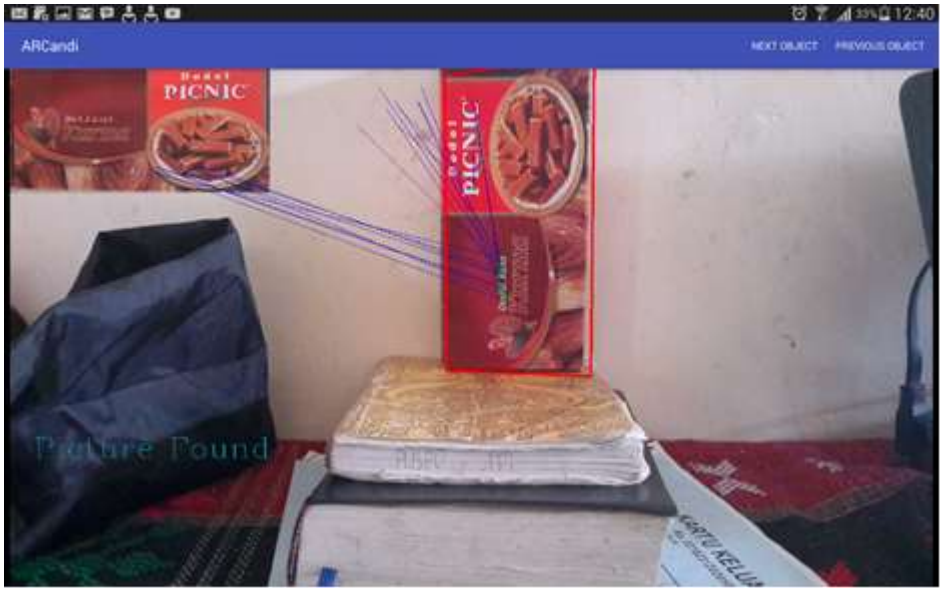

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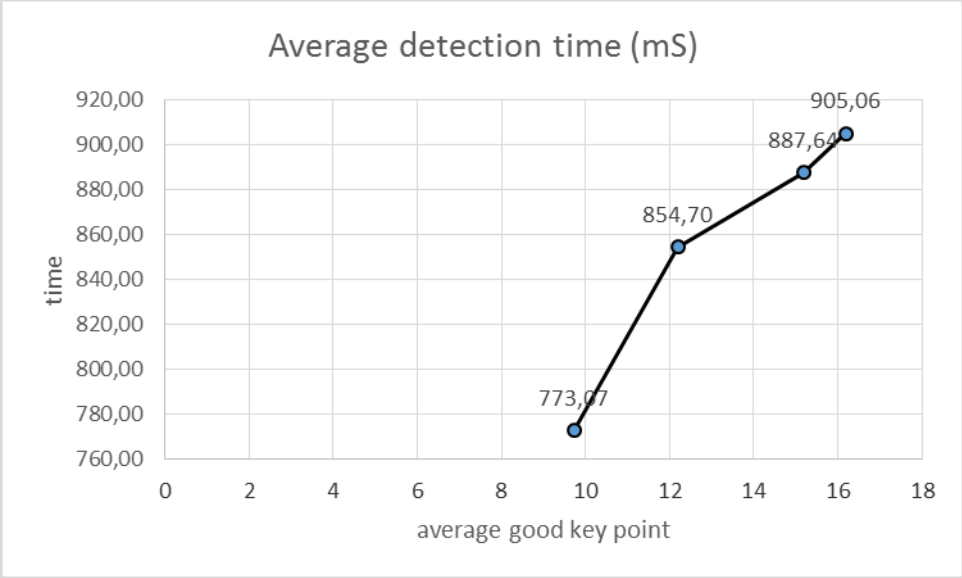

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