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Content Based Video Retrieval Intelligent Security System

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ABSTRACT

In this work we try to explore the use of content based video retrieval method to build an application in detecting moving object. The application will detect and recognize human walking styleeness in intelligent security system. Recently, the growth of crime activities in our neighbors going very fast. Further more text or characters security system by using password has some disadvantages such as easily to fraud , duplicate, and hard to remember as many passwords or PIN have to remember today. In order to solve to situation, intelligent security system urgently needed to protect our property and life. It needed to work 24 hours a day 7 days a week and 12 monthhs a year without tiring and exhausting. In this work we use content based video retrieval or CBVR in building the application. Approximately 500 video clips of human walking style used in this research, it has 30 second to 60 seconds in each clip. We use a moving glass doors to test and simulate the application, when a walking style detect and recognize .The simulation and testing show that application built from this research is quite good in detecting and recognizing one's walking style, even though its accuracy and the effectiveness has not been calculated yet.

Keywords : Video retrieval, intelligent security, walking styleness

INTRODUCTION

Face expresion can be considered one way of communication to express one's emotional and needs to some one else. There are six of face expressions such as : happy, wonder, scare, angry, and dispointed [1]. In

mean time [2] stated that face recognition system has been introduces for 50 years. Face recognition considered as branch of pattern recognition and computer vision. It is also considered biometrics feature. Face recognition considered as a branch of biometrics. Biometrics features can be used as PIN or password in the security system. This security system can be applied in banks, military zones, department of defence, and industry zones [3].

Recently, Text-based password still widely used as security code system both in computer system as well as in otherfields such in banking system, trading, manufacturing, and airport system. This system has many disadvantages since password using alphanumeric easy to steal , and to be hack. Some of text based password problems are when password is too long and compicated, it will be difficult to remember. Otherwise when password too short it will be cheated.

Face detection and feature extraction for grayscale image considered more difficult to be carried out since face skin tone characteritic does not exist. Face detection as an important step in the field of computer vision, biometrics, pattern recognition, multimedia application such as face tracking, face recognition, and video survelience *[4]*. Face recognition has two main application which are verification and identification. Verification solely matching new face image data to face image data in the database (one to one) and produce trua condition and false condotion. Whilst identification recognize someone by using similarity level decision.

In this papaer we introduce new technique as well as to build security system application in real time mode. It is proposed to automate opens and closes doors by applying content based video retrieval technique.There are several goals of this paper can be described as follow: i). applying moving object recognition through intelligent system; ii). moving human and non human detection; iii). build intelligent security sytem ; iv). Evaluating the effectiveness of content based video retrieval to improve security system

LITERATURE REVIEW

System Development

To develop application system in this research we used Waterfall mode [8]. It is a system development which has several steps specifically: system requirement, analysis, design, implemetation, testing, and maitenance. Whilst for for system process model used SDLC model and flowchart general process as illustrated in figure 2.

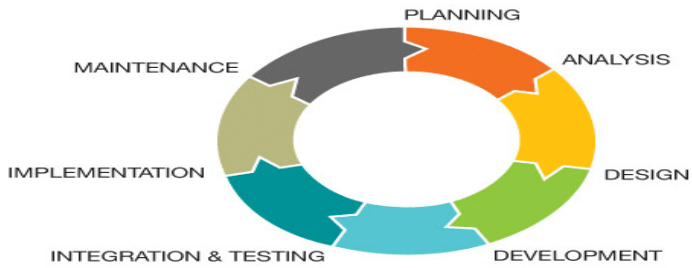

Fig.1 System develoment process

In planning and analysing step, we used ground truth approximetaly 500 walking styleness video clips with 30 to 60 seconds. Video clips was downloaded form CCTV installed in important places inside IIB Darmajaya campus. In design development, haar clasified facial tracking system technique has been used to desigmn the system. In this technique was carried out using rectangle feature to indicate a specific image. Algoritma Haar used statiscal method in detecting face. In this method Haar-like feature value considered the different between gray scle values inside black box area and white block area. The formula of haar-like can be written as:

$$f(x)n = \text{Sumofblack rectangle} - \text{sumWhite rectangle}$$

where f(x) is Haar-like value, whilst SumofBlack rectangle is number of black pixels in gray level and SumofWhite rectangle is number of white pixels in gray scale. When the different value is greater then threshold, it concludes that the feature exist.

Similarity Computation

To compute the similarity , in this research we used Euclidean distance between g colour histogram and h colour histogram , the formula of euclidean distance can be illustrated as :

$$d^2(h,g) = \sum\sum\sum(h(a,b,c) - g(a,b,c))^2$$

In order to search or match between image query and image inside database, we used a methode introduced by [5] This method called Markov Random Field (MRF), it charachterize by geometric structure and magnitute the power of interaction between neighbour pixels. In this method, texture considered as regresion function , g(x,y).

$$g(x,y) = \sum_{(m.n)\in N} a(m,n)g(x+m,y+n)sw(x,y)$$.

Where N is structure similarity measure paramater of every pixel or DCT coeficients. whilst (x,y) is signal probality in each pixel. To compute similarity , this work used the formula as follow:

$$D(g,p) = \sum_{t=1}^{T} f_{g,t} \log \frac{f_{g,t}}{f_{q,t}}$$

Where D(g,q) is the different two function , f_g function, f_g = ($f_{g,t}$: t=1, .., T) and f_q = ($f_{q,t}$: t=1,.., T), moreover the similarity obtained from D(g,q) and D(q,d) average.

In order to measure structure based similarity, SSIM used. Similarity was measured by the relation between two objects or funtions, structure function and content function. Whiiilllst, structure similarity is measured using structure of two objects. According to [7] (Jana et.al., 2009). [6] and [7] (Sheikh et al. [2006] stated that to cmpute structure based similarity can be used this equation:

$$SSIM(X,Y) = \left(\frac{2\mu_x\mu_y + C_1}{\mu_x^2 + \mu_y^2 + C_1}\right).\left(\frac{2\sigma_x\sigma_y + C_1}{\sigma_x^2 + \sigma_y^2 + C_1}\right).\left(\frac{\sigma_{xy} + C_3}{\sigma_x + \sigma_y + C_3}\right)$$

Where μ_x is mean of x and μ_y is y, σ_x and $\sigma_{y\backslash}$ considered as stndard deviation of x and y. Whilst σ_{xy} is coovariance of x and y, C_1,C_2 and C_3 are contants. SSIM or structure similarity measure is similary measuring based on struture. Content based video retrieval technique used to find the similarity walking styleness between video query and video inside video database .

Video Matching

To cmpute similarity feature, we used colour and texture

features since both features similar to signature S. S signature can be defined as group of cluster C of {mi,wi}|≤ 1 ≤}. Where each cluster represents mean of vector feature mi and wi feature population. The similarty between signatures can be computed by using Earth Mover's Distance(EMD) formual, as follow [9].

$$EMD(P,Q)= \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} d_{ij}f_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} f_{ij}}$$

Where dij is distance between two clusters mi and mj, and fij funtion depend on wi and wj cluster.

RESEARCH METHOD

Ground Truth and System Architecture

In this work we used not less that 500 walking styleness video clip, it has duration fron 30 seconds to 60 secons. In this work, we used Personal computer with 2 RAM and 1 TB hard disk. We also used mirocontroler Mega 2560 Rev3, IP Cam, and 1 router.

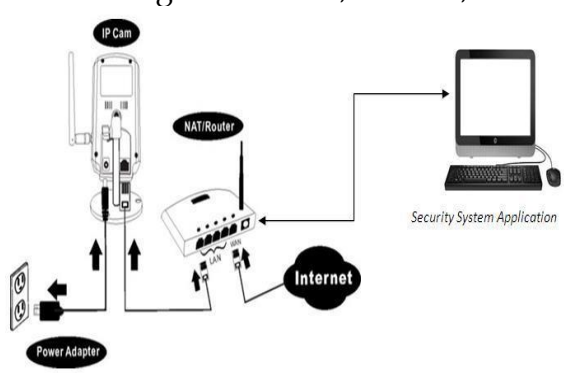

Fig. 2 System Architecture

In this system we used JDK, JAVA Framework, MySql Database (DBMS), Browser, IDE Netbean, Micro Controler.

FINDINGS AND DISCUSSION

In this research an algoritm of detecting and recognizing moving object or human walking styleness . Start from the process of image or object detection by capturing using IP camera. Data read by camera then collecting into temporary database. Finally, moving object read retrieved and similarity between object calculated and computed the accuracy.

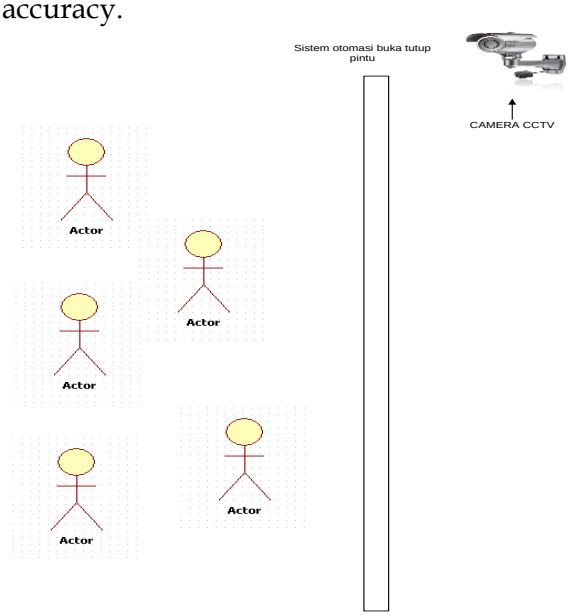

Fig 3. Moving object dtection flow diagram

The algorithm of moving object detection can be described, as follow:

- several moving object (human) entering the doors
- Input human image captured by camera
- Identification image input into database

Doors opening process algorithm

The process of opening the doors when moving object detected , begin with human captured by camera. Moving object (human) has been identified and put in the database . When identified human simiolar to moving object in the database, the doors open

CONCLUSION

The application of intelligent security system built by this work shows that quite acurate to detect and recognize moving object (human walk style). One advantage of the application, it can be used to detect and recognize more than one person who entering or passing the doors

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