

Chapter 1

An Intelligent Thermal Imaging System Adopting Fuzzy–Logic–Based Viola Jones Method in Flu Detection

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ABSTRACT

Some infectious diseases can spread rapidly via a community of human or animals or both, either through airborne particles or viruses. Such rapid spread diseases may become a local, national or international widespread and contagious threat. As a symptom of infection, the body temperature of a disease carrier is higher than normal people. In this chapter, flu detection system using thermal imaging tool and computer vision techniques are discussed. An automatic flu detection method adopting human object extraction algorithm and fuzzy logic based Viola Jones

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algorithm are also discussed. The proposed system able to capture a thermogram of the human subject, detecting the eye region of the human subject, calculating the pixels values around the detected eye region, converted to temperature readings and further classified the subject's body temperature whether the subject satisfies a flu condition or not. Experimental results also shown that the proposed fuzzy logic based Viola Jones algorithm can trace out flu infectious personal from the input thermal images up to 80% of accuracy.

INTRODUCTION

Flu is a type of infectious disease induced by the outspread of influenza virus. The dominant symptoms on the flu infected personal comprise of: high fever, sore throat, running nose, headache, muscle pains, coughing, fatigue, congestion and muscle aches. From all these symptoms, a rise or drop in body temperature may be an early symptom of such disease, and as such it may be desirable to measure the body temperature of each person for flu detection. This may help to detect and quarantine infected individuals at certain locations such as airports or border, to prevent a disease entering a region, state or country. Conventional flu detection system using contact measurement system (clinical thermometer), whereby modern flu detection system applying contactless measurement system (infrared thermometer and infrared camera), both are to trace out whether there is an existence of infectious disease active carrier or not for release pass or quarantine purposes. The main merit of modern flu detection system as compare to conventional flu detection system is that in the contactless flu detection system, the security personal no need to have physical contact with the examinee. In a better version of contactless flu detection system, the image processing based flu detection system can help free up the long que faster, saving times, at the meantime offering the examinee a more relaxing body temperature measurement way.

In general, the contactless flu detection system can be divided into two main categories, one is by the infrared thermometer measurement and another one is by the infrared imaging capturement. Infrared thermometer measurement is by the use of medical infrared thermometer or the door type forehead thermometer. The infrared thermometer first invented by (Egawa, 1997) comprising an infrared sensor for receiving heat radiation from an object and an arithmetic circuit which calculates the temperature readings. The door type forehead thermometer manufactured by TECOS (Topteches 2015) is a walkthrough forehead thermometer. The examinee

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