Gesture and Voice Control of Internet of Things

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ABSTRACT

Nowadays, people's life has been remarkably changed with various intelligent devices which can provide more and more convenient communication with people and with each other. Gesture and voice control are becoming more and more important and widely used. People feel the control system humanized and individualised using biological control.

In this thesis, an approach of combined voice and gesture control of Internet of Things is proposed. A prototype is built to show the accuracy and practicality of the system. A Cortex-A8 processor (S5PV210) is used and the embedded Linux version 3.0.8 has been cross-compiled. Qt 4.8.5 has been ported as a UI (User Interface) framework and OpenCV 2.4.5 employed as vision processing library. Two ZigBee modules are used to provide wireless communication for device control.

The system is divided into control station and appliance station. The control station includes development board, USB camera, voice recognition module, LCD screen and ZigBee module. This station is responsible for receiving input signal (from camera or microphone), analyzing the signal and sending control signal to appliance station. The appliance station consists of relay, ZigBee module and appliances. The ZigBee module in the appliance station is to receive control signal and send digital signal to connected relay. The appliance station is a modular unit that can be expanded for multiple appliances.

The system can detect and keep tracking user's hand. After recognizing user's gesture, it can control appliances based on certain gestures. Voice control is included as an additional control approach and voice commands can be adjusted for different devices.

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LIST OF ABBREVIATIONS

Various specialized abbreviations are used in this thesis as listed below:

API……Application Programming Interface

CamShift……Continuously Adaptive Mean Shift

CAN……Controller Area Network

CMOS……Complementary Metal-oxide Semiconductor

COM……Common

Cramfs……Compressed ROM File System

CPU……Central Processing Unit

DNN……Deep Neural Networks

DTW……Dynamic Time Warping

EEG……Electroencephalograms

EN……Enable

EPIC……Electric Potential Integrated Circuit

GPIO……General-Purpose Input/Output

GND……Ground

GUI……Graphical User Interface

HMM……Hidden Markov Model

HSV……Hue-Saturation-Value

IoT……Internet of Things

IR……Infrared

ISO……International Organization for Standardization

JFFS……Journaling Flash File System

LCD……Liquid-Crystal Display

LED……Light-Emitting Diode

MCU……Microcontroller Unit

MFC……Mel Frequency Cepstum

MFCC……Mel Frequency Cepstum Coefficients

MSEPF……Mean Shift Embedded Partial Filter

NFS……..Network File System

NC……Normally Closed

NO……Normally Open

RAM……Random-Access Memory

RFID……Radio-Frequency Identification

RGB……Red-Green-Blue Color Model

ROM……Read-Only Memory

SASOM……structure adaptive self-organizing map

SCFG……Stochastic Context Free Grammar

SIFT……Scale Invariant Feature Transform

SPDT……single-pole, double-throw

SURF……Speeded Up Robust Features

TTL……Transistor–transistor Logic

UART……Universal Asynchronous Receiver/Transmitter

UI……User Interface

URC……Universal Remote Console

USB……...Universal Serial Bus

YAFFS……Yet Another Flash File System

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