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** Rename file as PXX.docx where XX is your group number.*		Member 2:	Xin Zijie	Username: t0926118
Project Title:		Voice-Controlled and Environment Detection Air Conditioning System		

DESCRIPTION OF PROBLEM

- problem statement

Nowadays, with the rapid development of technology and increasing work pressure, people rely more and more on technology to help them complete the trivial things in life to improve work efficiency and quality of life.In the scorching summer, among all these trivial matters, controlling air conditioners and fans is undoubtedly a typical representative.Therefore, our group will focus on this problem and use AIot to help busy people realize automatic control, voice control, intelligent display and intelligent reminder of air conditioners and fans.

- problem explanation

1) With the rise of artificial intelligence and the popularization of the Internet of Things, smart home has become a general trend. However, since this field is still in a stage of rapid development, there is still no smart system that can fully realize the following four functions,which is intelligent switching and control of air conditioners and fans according to personal work and rest, voice control of air conditioners and fans, intelligent display and intelligent reminder when the temperature is low.
2) With global warming and environmental deterioration, many of us pay more and more attention to a series of issues such as energy saving and environmental protection, and smart control of air conditioners and fans are one of the magic weapons that can help us solve this problem.
3) In real life, it is sometimes difficult for us to switch and control air conditioners or electric fans in real time due to busy life or time constraints. For example, when sleeping at night, because air conditioners and fans often only have the function of turning off regularly, we cannot realize real-time control of air conditioners and fans to save energy and obtain the best sleep experience; or when we are busy with work and have no time to spare our hands or leave our seats, because the air conditioner or fan can only be controlled by a remote control or a control panel, we cannot meet our own adjustments to the air conditioner and fan in time; or when we are so busy that we ignore the reduction in indoor temperature, because the air conditioner and fan can't automatically remind us

that the temperature is low, we may forget that we need to add coats or blankets to prevent diseases, etc. As a result,it can be seen that the smart control system of air conditioners and fans is not only effective mean to improve people's quality of life and work efficiency, but also effective measure to prevent diseases such as cold caused by staying in low temperature rooms for a long time.

DESCRIPTION OF PROPOSED SOLUTION

- IoT hardware explanation

For the IoT part, our group decide to use the humidity and temperature sensors to collect the data. Humidity and temperature will be collected by DHT11 sensor. Then the collected data will be sent to the Micro:bit by Bluetooth. And Micro:bit will sends the data to Raspberry Pi. The Raspberry Pi uses MQTT to communicate with the laptop or server. After predicted by the machine learning model on servers, the result will be sent back to the Raspberry Pi. And the Raspberry Pi send the command to control the fan and the air-conditioner. Additionally, if the temperature is very low, the system will remind the user to put on more coats or sweaters.

Also, a microphone will be installed on Raspberry Pi in order to receive the voice command of people. The voice data will be sent to the server for machine learning model to analyze, and the Raspberry Pi obtains the commend to control the fan and air-conditioner in case that the humidity-temperature model fail to control the devices and the user want to open the fan or air-conditioner manually.

The overall system is using temperature and humidity data to predict the current environment condition. Then the system will control the two devices according to the environment. Also, the user can control the two devices manually through the microphone.

- AI explanation

For the machine learning, On the one hand, after collecting a large amount of data on whether turning on an air conditioner or fan at different condition of temperatures and humidity, our group intend to use decision tree classfier and a neural network to train a model which will accurately determine the best operation. On the other hand, we will achieve the voice control by using the Speech_Recognition API of Google's online voice recognition network. Accuracy and detection speed of the API continued to improve in recent years by deep learning and big data. Hence, we will choose it to implement our language control model. Last, through training of machine learning, a threshold will be set to determine the state of whether it will alert people to add clothing.

- Frontend and Backend applications

  For the server, our group will apply the MQTT and basic web service together. The MQTT will be used to transmit the temperature, humidity data and control commands. The web service will be applied on the voice data uploading. Also, the communication between the application and server will be based on the web service as well.

  For the application, our group decides to design an application to show the current temperature and humidity. Also, a notification will be sent to the user's phone when the fan or the air-conditioner is on and when the temperature is relatively low. Besides, the user can use the application to control the air-conditioner and fan remotely.