SIT740 Research and Development in Information Technology

High Distinction Task 6.1: Propose/Pitch an Idea

IOT voice monitoring application using AI chip:

Introduction:

With the fast-growing world, there is an increase in need to monitor and regulate various activities of mankind to ensure safety and privacy. This had led to various surveillance/monitoring systems with Video surveillance system being the most popular. However, video surveillance system has limitations in situations where visual recording is not feasible or simply not allowed. A viable way to address this limitation would be implantation of voice recognition system. The proposed idea dives into the usage of AI on chip (CM1K) combined with IOT technologies for voice monitoring application in security, education and media.

Description:

The existing neural networks AI algorithms used for IoT applications are software-based and are run on classical processors which are slow for pattern recognition processing. The idea is to train a hardware neural network AI system on CM1K chip designed for fast pattern recognition processing to perform voice recognition task. The concept is to have a standalone AI system connected to an IoT system that receives and process audio signal to determine number of voices in the audio signal in real-time. The system should be able to perform data processing (data segmentation) and classification (clustering and results). The voice training dataset is fed to train the CM1K chip after successful training the model is ready to be tested on the data from IoT system. The data received undergoes segmentation to convert the audio signal to respective coefficients and is sent to the CM1K chip for testing or recognizing in this case. If the voice is recognised the process also checks for if the voice was recognised before or else an increment counter is added to notify and retrain the chip on the new data.

Process flow diagram:

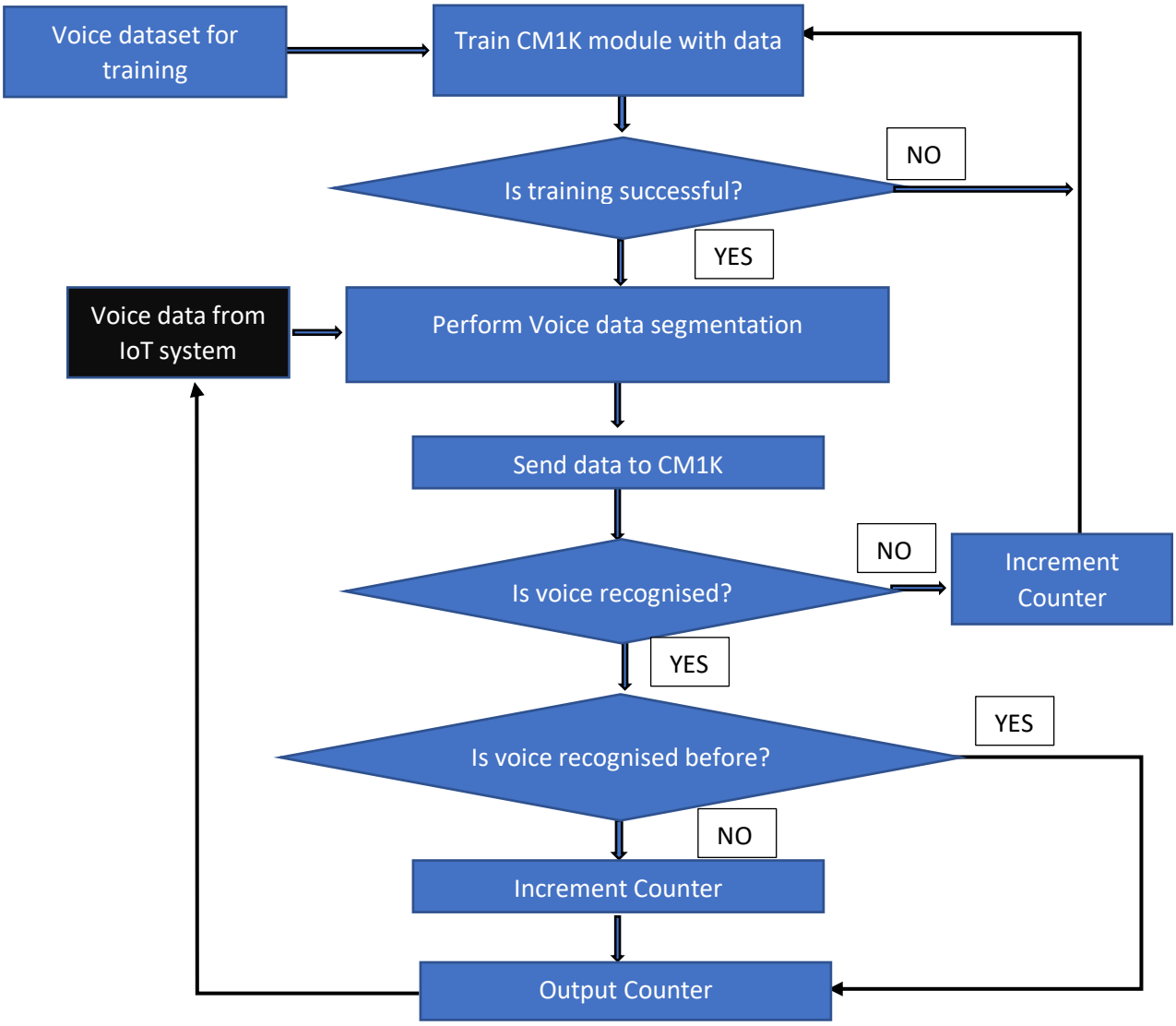
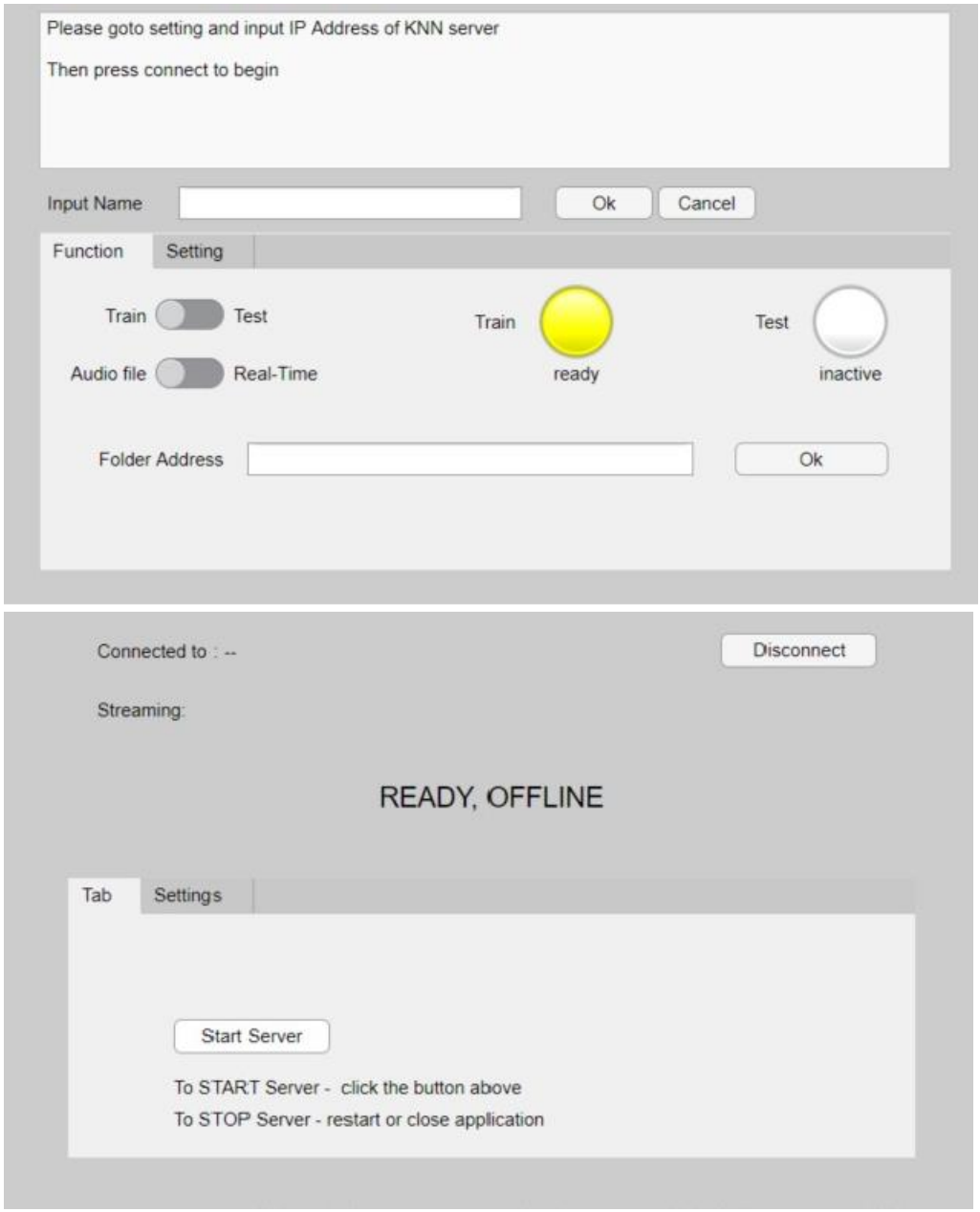


Fig 1. Flowchart of the process flow.

User Interface:



Application:

The system if designed and integrated with IoT system can overcome the limitation of video surveillance systems. The implementation of voice recognition system on neuromorphic chip (CM1K) is a great step to understanding and improving cognitive computing. The neuromorphic chips are faster and has more potentials for cognitive computing than algorithms that run on classical computers.

Advantages:

1. Smart and efficient voice recognition system.
2. Being AI enabled the system adapts to varied circumstances.
3. Most economical than video surveillance system.
4. Faster than ones running on classical computers.
5. Better performance than algorithms implemented on software.

Potential Drawbacks:

Ethical considerations such as intellectual property protection, user data privacy can be few drawbacks when the system is implemented on a commercial scale. Where data and privacy intrusion can be a problem as with everything that is on the internet.

Video link: https://video.deakin.edu.au/media/t/0_pvvk144e

Reference:

1. Noah Moroze. "Experiments with the CM1K Neural Net Chip." Medium https://towardsdatascience.com/experiments-with-the-cm1k-neural-net-chip-32b2d5ca723b.
2. Y. Chen et al., "Neuromorphic computing's yesterday, today, and tomorrow – an evolutional view," Integration, vol. 61, pp. 49-61, 2018/03/01/ 2018, doi: https://doi.org/10.1016/j.vlsi.2017.11.001.
3. S. S. Tirumala and S. R. Shahamiri, "A review on Deep Learning approaches in Speaker Identification," in Proceedings of the 8th international conference on signal processing systems, 2016: ACM, pp. 142-147.
4. S. Jothilakshmi, V. Ramalingam, and S. Palanivel, "Speaker diarization using autoassociative neural networks," Engineering Applications of Artificial Intelligence, vol. 22, no. 4, pp. 667-675, 2009/06/01/ 2009, doi: https://doi.org/10.1016/j.engappai.2009.01.012.
5. B. Juang and L. R. Rabiner, "Automatic Speech Recognition–A Brief History of the Technology Development Abstract," 2005.