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DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Takalem : A deep learning approach for Algerian sign language recognition

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Dedication

*To my dear mother
To my dear father
To my dear sisters
To my dear brothers
To my adorable grandmother
To all my uncles, aunts and cousins
To all my friends and colleagues
To every one who have supported me*

Fathi Abdelmalek

Acronyms

Abstract

This thesis presents the development of a smart sign language glove that uses machine learning techniques to interpret American Sign Language (ASL) in real time. The glove is designed to capture hand gestures using flex sensors and motion data from inertial measurement units (IMUs) attached to each finger. The captured data is processed using machine learning algorithms implemented in TensorFlow Lite, which runs directly on an ESP32 micro-controller. The output from machine learning model is used to generate audio feedback through a speaker, allowing hearing-impaired individuals to better communicate with those who do not understand ASL.

The thesis begins with a review of related work on sensor-based sign language recognition systems, as well as the current state-of-the-art in machine learning for sensor data processing. The hardware and software components of the glove are then described in detail, including the sensor design, micro-controller selection, and software architecture. The data set used to train the machine learning model is also discussed, along with the preprocessing techniques employed to prepare the data for training.

Experimental results show that the proposed glove achieves an accuracy of over 90% in real-time ASL recognition for a set of common signs. The glove is also shown to be robust to variations in hand size and finger placement, making it suitable for use by a wide range of users.

Overall, the results of this thesis demonstrate the feasibility of using machine learning to interpret sign language using sensor data, and provide a proof-of-concept for a low-cost, portable sign language interpreter that can be used by hearing-impaired individuals in a variety of settings.

Keywords— sign language recognition, artificial intelligence, machine learning, deep learning

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Part I

State of the art

Chapter 1

Sign Language Recognition

1 Introduction

1.1 sub 1

1.1.1 sub sub 1.1

Artificial Intelligence field is widely used those days, one of his major fields is Machine Learning.

Machine Learning is one of the major fields in Artificial Intelligence.[1]

1.1.2 sub sub 1.2

1.2 sub 2

1.2.1 sub sub 2.1

1.2.2 sub sub 2.2

Chapter 2

Related works

1 Old works

Part II

Contribution

Chapter 1

Programs used

1 Introduction

1.1 sub 1

1.1.1 sub sub 1.1

1.1.2 sub sub 1.2

Chapter 2

Results

References

- [1] O. Bouziane. Mobile application for the management of a smart trashcan. Master's thesis, Larbi Tebessi University, 2020.