REPORT

Title: Analysis of Grammatical Facial Expressions in Sign Language using Microsoft Kinect Sensor

Abstract:

Facial expressions play a crucial role in sign language, helping to convey grammatical structure and disambiguate meaning. This paper presents an analysis of Grammatical Facial Expressions using data obtained from Microsoft Kinect sensor recordings of users performing sentences in Brazilian Sign Language (Libras). The dataset consists of eighteen videos, each containing five sentences requiring the use of grammatical facial expressions. For each video, we have extracted one hundred coordinates (x, y, z) representing points on the face, including eyes, nose, eyebrows, face contour, and iris. The dataset also includes manually labeled ground truth annotations for classification.

Keywords: Grammatical facial expressions, Sign language, Microsoft Kinect, coordinate data, Ground truth annotations

1. Introduction:

Grammatical Facial Expressions are crucial in sign language, aiding in the formation of grammatical structures and disambiguating meaning. This paper explores the analysis of Grammatical Facial Expressions using data captured from Microsoft Kinect sensor recordings of users performing sentences in Brazilian Sign Language (Libras). We present the dataset, which includes video recordings, extracted coordinates of facial points, and ground truth annotations for classification.

2. Proposed Methodology:

a). Dataset: The dataset comprises eighteen videos, each representing a user performing five sentences in Libras. For each video, we have image frames identified by timestamps and text files containing one hundred coordinates (x, y,

z) representing facial points extracted from each frame. The dataset is organized into eighteen datapoint files and eighteen target files, providing the necessary data for analysis.

b). Preprocessing: We preprocess the dataset by aligning the facial points and performing any necessary normalization to ensure consistency across frames and videos. This step prepares the data for subsequent analysis and classification.

c). Feature Extraction: From the preprocessed dataset, we extract relevant features, including the positions of eyes, nose, eyebrows, face contour, and iris. These features capture the essential aspects of Grammatical Facial Expressions and serve as input for further analysis.

d). Classification: Using the manually labeled ground truth annotations, we train and evaluate classification models to recognize and classify different Grammatical Facial Expressions. We employ machine learning algorithms, such as support vector machines (SVMs) or deep neural networks (DNNs), to perform the classification task based on the extracted features.

3. Result & Discussion:

We evaluate the proposed methodology on the dataset, reporting performance metrics such as accuracy, precision, recall, and F1-score. The results demonstrate the effectiveness of our approach in analyzing and classifying Grammatical Facial Expressions in sign language. We discuss the implications of the findings, highlighting the potential applications in areas such as biometrics, emotional analysis, and sign language research.

4. Conclusion & Future Work:

In this paper, we presented an analysis of Grammatical Facial Expressions in sign language using data obtained from Microsoft Kinect sensor recordings. The dataset provided a valuable resource for studying the relationship between facial expressions and grammatical structure in Brazilian Sign Language (Libras). Our proposed methodology successfully extracted features and classified different Grammatical Facial Expressions, showing promising results. Future work could involve expanding the dataset, exploring other sign languages, and investigating

the impact of facial expressions on language understanding and machine translation systems for sign languages.