Cross-Cultural Differences in Inaugural Speech Hand Gestures:

A Study Incorporating Automated Hand Gesture Recognition

Alan Kuo
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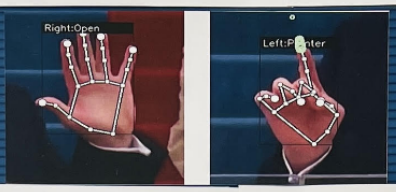

Keywords: Hand gestures; Google MediaPipe; MediaPipe Hands; Inaugural speech; Inauguration speech; Cross-Cultural

Western Presidents/PMs (US & UK) vs. Eastern Presidents (Taiwan & China)

Introduction / Motivation:

Interacting with robots will be a daily task in the future. In the multimodal linguistics field, it is an important goal to collect data and use machine learning to train AI to better communicate. Multimodal linguistics refers to the multi-factors of linguistics, where the different modalities range from verbal speech to nonverbal body language. Among the nonverbal modalities of communication, hand gestures are a particularly important component. They systematically integrate with speech and can convey thoughts and emotions, and make speeches more interesting.

This study focuses on using automatic hand gesture recognition to identify pre-set types of hand gestures in presidential (and Prime Minister) inauguration speeches. I became interested in this topic when I read a comment under the second 2020 US presidential debate video. It poked fun at how President Trump "plays the accordion every time he talks." Indeed, I noticed President Trump's abundant use of hand gestures.

I wondered why he - and president Biden - used so much body language in formal contexts compared to Taiwan's presidents. Is it caused by a cultural difference? Speculating that western presidents used more gestures, I sampled Western (US, UK) and Eastern (Taiwan, China) presidential inauguration speeches. In these speeches, I found that Taiwanese and Chinese presidents did not use hand gestures in their inaugural speeches, while the results were mixed for UK PMs, and the US presidents were by far the most expressive with their hands, often using them to elicit audience applause. I observed for correlations between such gestures and applause.

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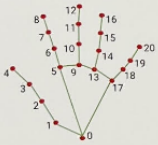
1) I researched automatic gesture recognition and used Google's Mediapipe gesture-recognition framework. Mediapipe is a set of trained algorithms that provides the basic functionality of spotting "landmarks," or key points. The landmarks for hands are shown below.



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4) With my modified code, I automated the process of identifying and counting hand gestures in the president (and PM) inauguration videos. The data of this study consists of 15 YouTube videos (see Table 1) of the inaugural speeches of the last 5 presidents of the US, the last 5 PMs of the UK, the last 4 Presidents of Taiwan, and president Xi Jinping from China. The videos were trimmed to only contain the speech, and ran in a streamlined form.

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Results:

videoid	l_close_n	l_open_n	l_pointer_n	l_ok_n	r_close_n	r_open_n	r_pointer_n	r_ok_n
UK_001_Truss.mp4	1	0	0	0	0	0	0	0
UK_002_Johnson.mp4	76	29	10	0	1	2	0	0
UK_003_May.mp4	1	3	0	0	0	0	0	0
UK_004_Cameron.mp4	0	0	0	0	0	0	0	0
UK_005_Brown.mp4	1	11	0	0	0	0	0	0
US_001_Biden.mp4	61	85	7	0	1	6	0	0
US_002_Trump.mp4	74	169	22	6	13	119	1	8
US_003_Obama1.mp4	71	24	11	0	18	17	4	0
US_004_Bush1.mp4	11	17	0	0	0	0	0	0
US_005_Clinton1.mp4	64	42	11	0	2	0	0	0
TW_001_Lee.mp4	0	0	0	0	0	0	0	0
TW_002_Chen.mp4	0	0	0	0	0	0	0	0
TW_003_Ma.mp4	0	0	0	0	0	0	0	0
TW_004_Tsai.mp4	0	0	0	0	0	0	0	0
CN_001_Xi.mp4	0	0	0	0	0	0	0	0

Discussion & Conclusion:

The results of my study indicate that there are cross-cultural differences when it comes to inaugural speech hand gestures. Taiwanese, Chinese, and UK (with the exception of PM Johnson) presidents barely used their hands compared to the US presidents, who used numerous hand gestures to emphasize certain points and invite audience applause.

I noticed that the audience clapped more regularly during US Presidents' speeches. In The Language and Body Language of Politics (1984), Atkinson discussed the role of hand gestures in political speeches. He claimed that non-verbal behavior, such as hand gestures, timing and intonation, can be used to signal a point where audience applause is expected.

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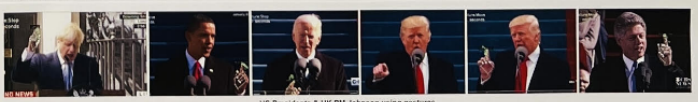

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President Chen, President Ma, President Tsai (Taiwan) and Chairman Xi (China)

It is important to note that the program occasionally made detection errors, such as recognizing a hand where there is not one. There were also certain bugs with recognizing the r_OK_n (right half of screen, OK gesture) gesture. Detection errors should be fixed as improvements are made to the trained detection algorithm. In addition, the camera would sometimes shift to the audience mid-speech, where gestures would be detected and recorded as well.

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As robots have more and more opportunities to join human social interactions, multimodal linguistics and AI machine learning is crucial for effective communication. In future projects, I plan to sample more videos to explore interactions between the modalities of gesture and speech — such as the relation between the "pause" and audience applause. I hope my data and findings can contribute to AI development!

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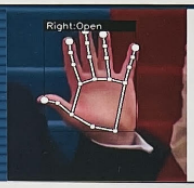

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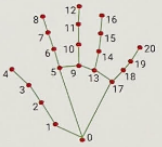

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US Presidents' "Point" Gesture vs Rounds of Applause

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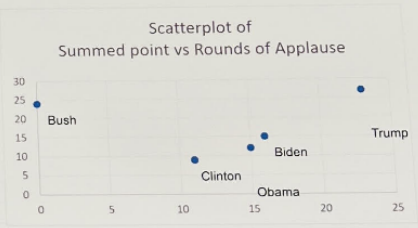

Correlation coefficient **r = 0.034266586**
This indicates negligible/nonexistent correlation between point gestures and rounds of applause.

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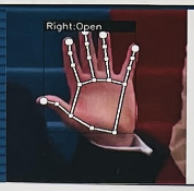

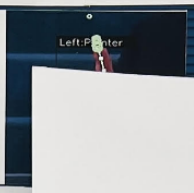

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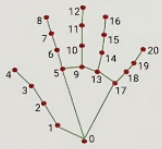

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Evidently, Bush is an outlier → remove it and recalculate:

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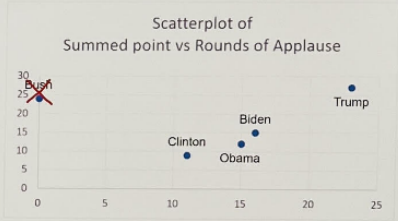

Recalculated correlation coefficient **r = 0.983913813**
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