Affective Awareness Agents in Virtual Reality

Presenter- Sweta Das

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Acknowledgements

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Flow of presentation

1. Background and Objectives
2. The idea
3. System Design and Architecture
4. Recognize emotions from speech
5. Recognize emotions from face
6. Return a suitable response in addition
7. Demo
8. Results
9. Impact
10. Future improvements
11. Discussion
12. Question-Answer

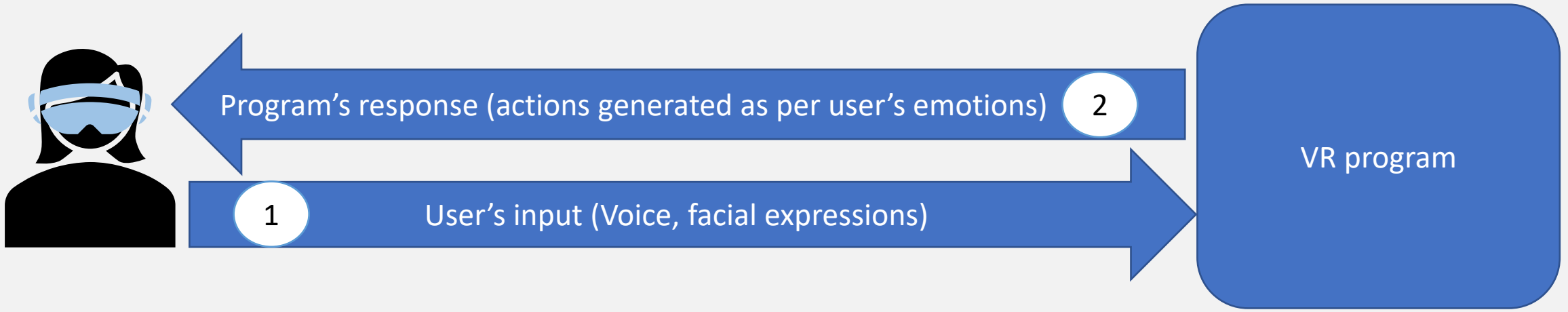
Background and Objectives

"The aim is to recognise the overall emotions of a user from his or her facial expressions and speech. "

Sub-divided as:

1. Recognize emotions from speech
2. Recognize emotions from facial expressions
3. Return a suitable response in addition

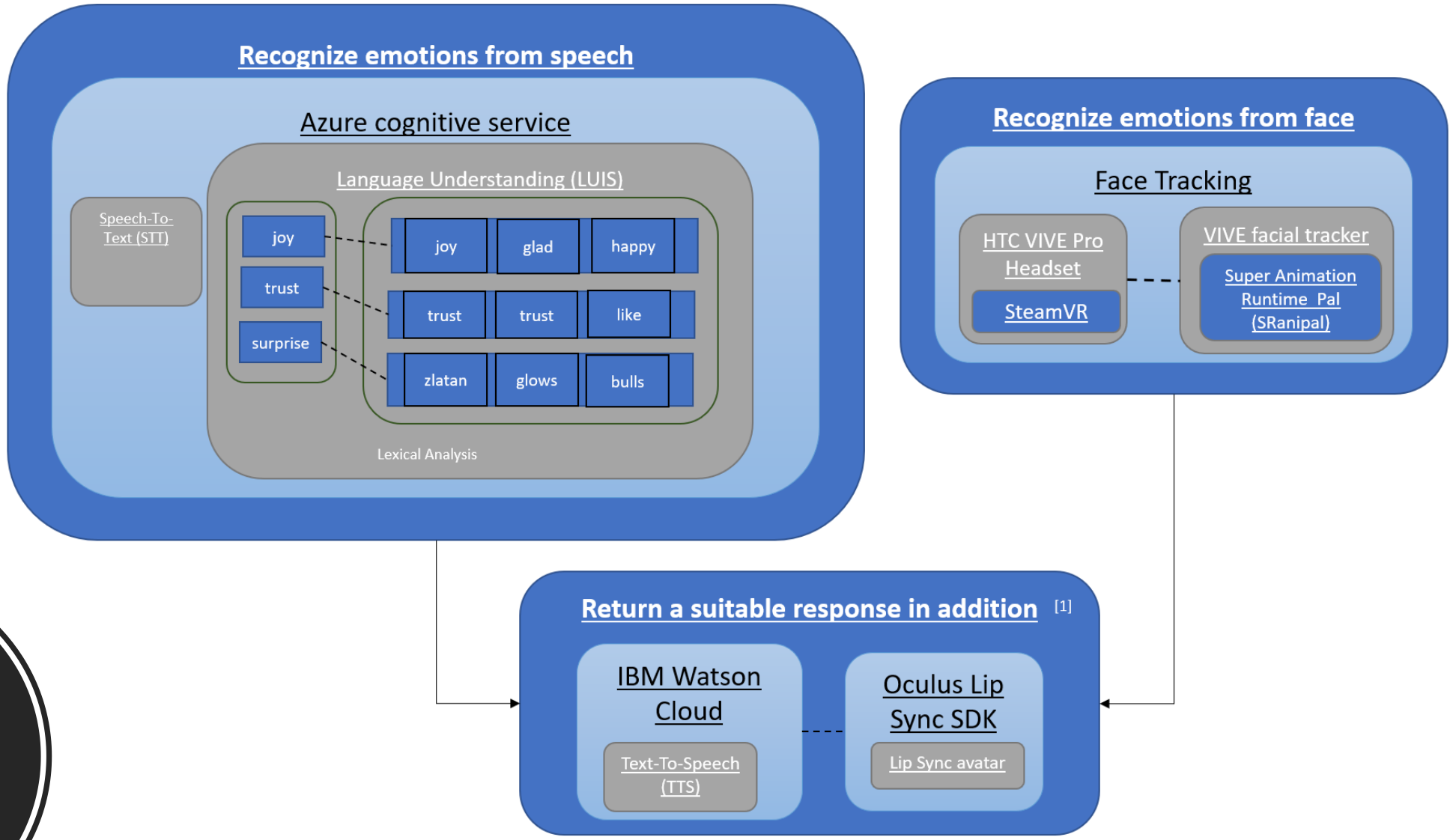
The idea



The whole idea in 2 arrows

[1] Scott Hwang's GitHub project for Lip sync using Oculus SDK and IBM Watson Cloud

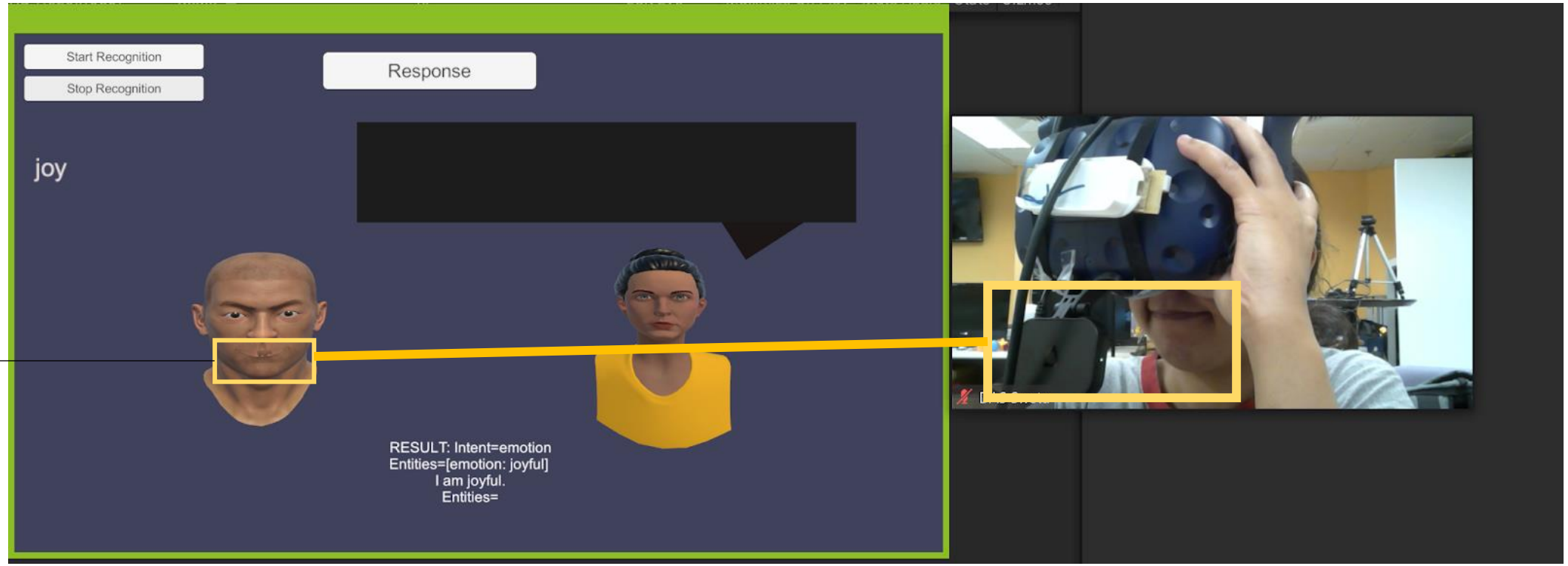
Tools and Techniques used



A brief utilization of tools and techniques found

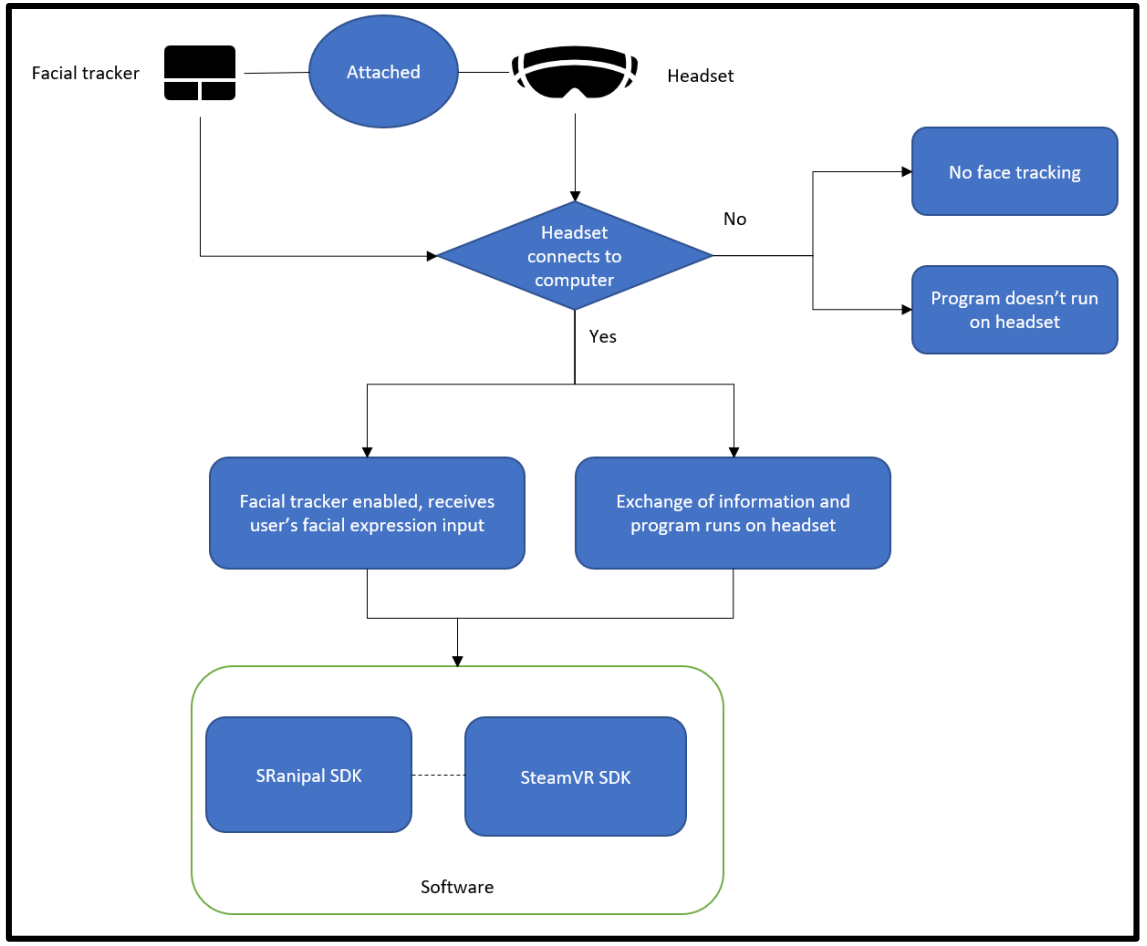
Tools and Techniques used

Facial expressions replicated by 3D model

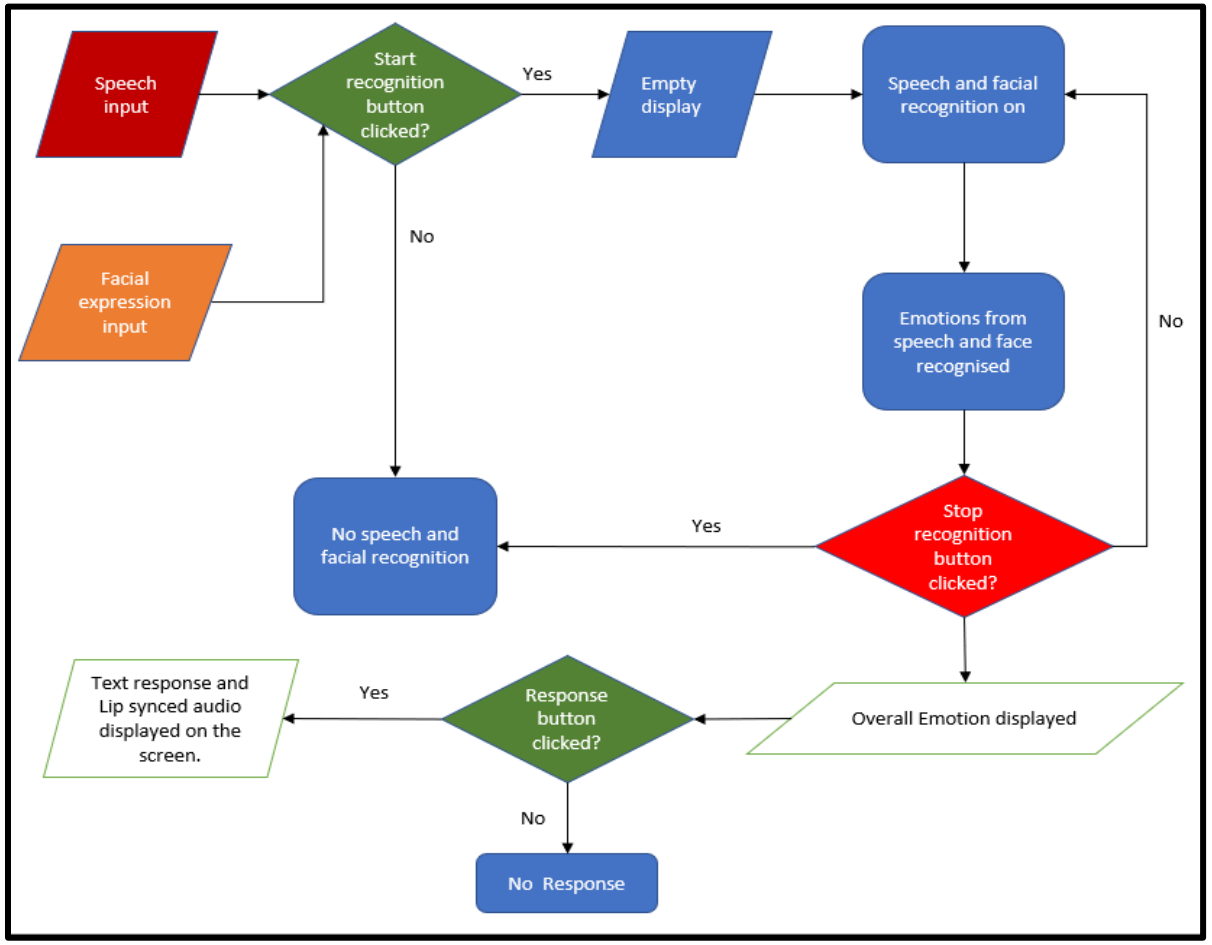


Facial tracking set-up, only lower mouth being detected in process

System Design and Architecture

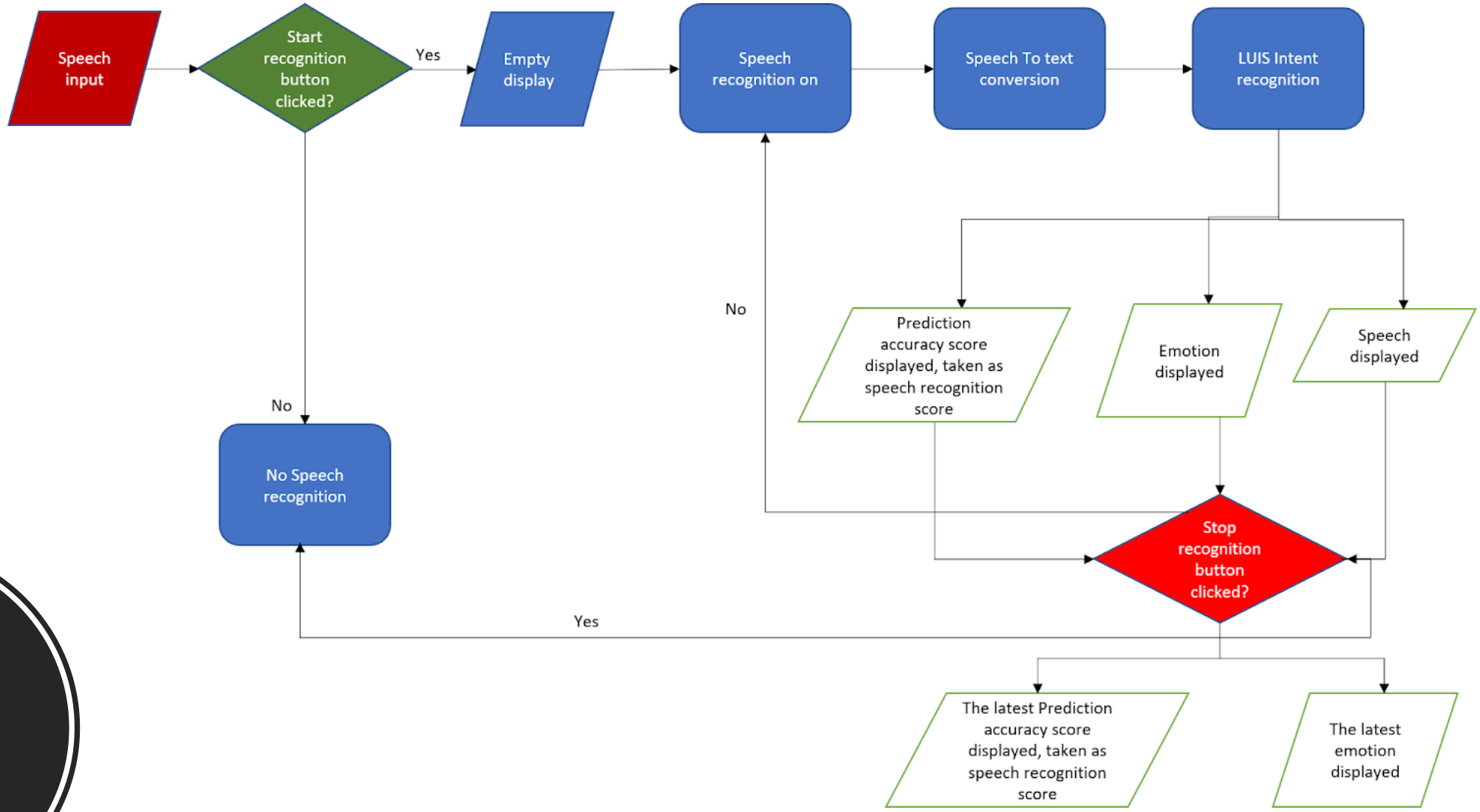


Overall Setup



Overall Software Design

Recognize emotions from speech

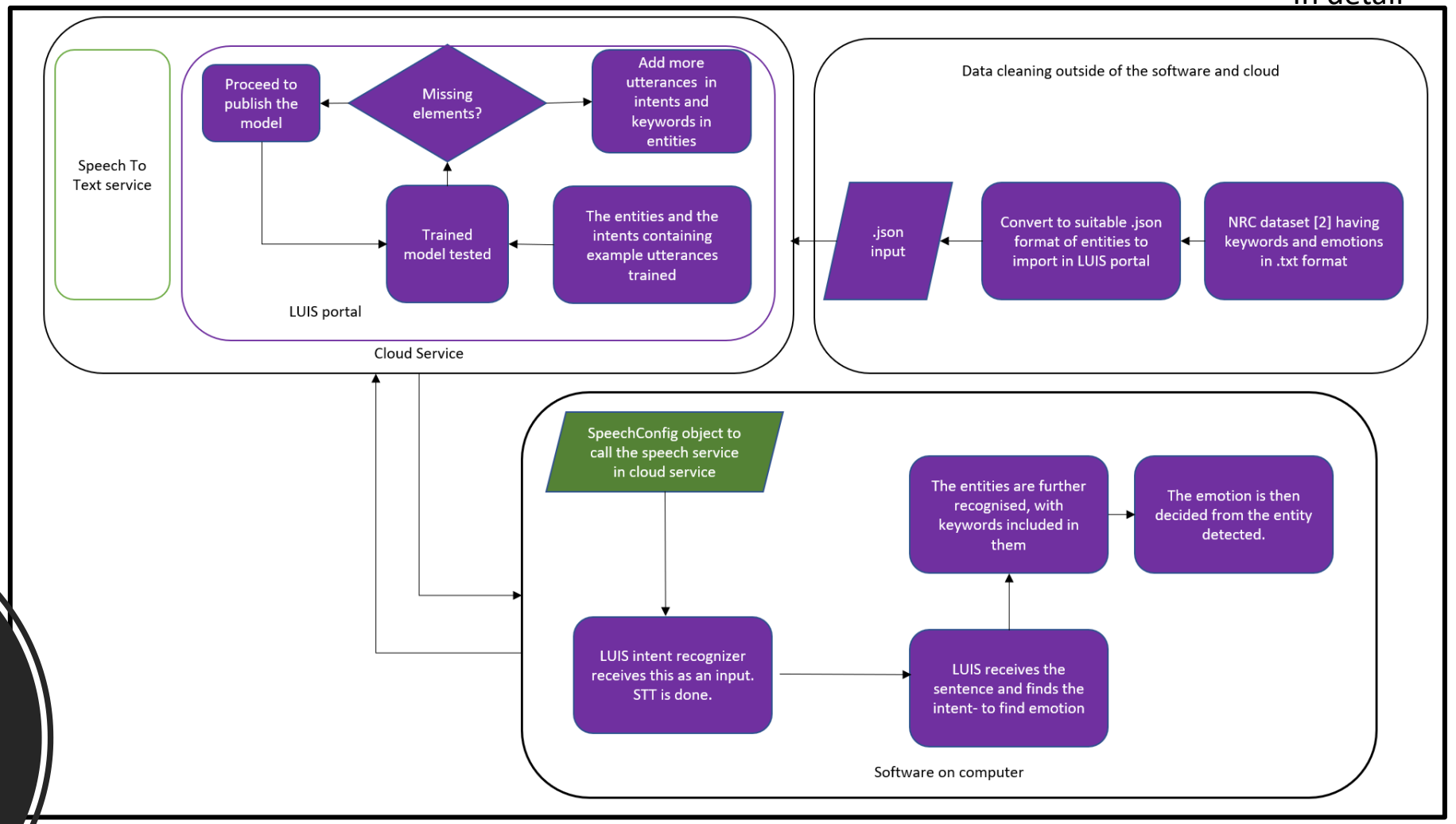


Emotional recognition from speech in brief

Recognize emotions from speech

In short

In detail

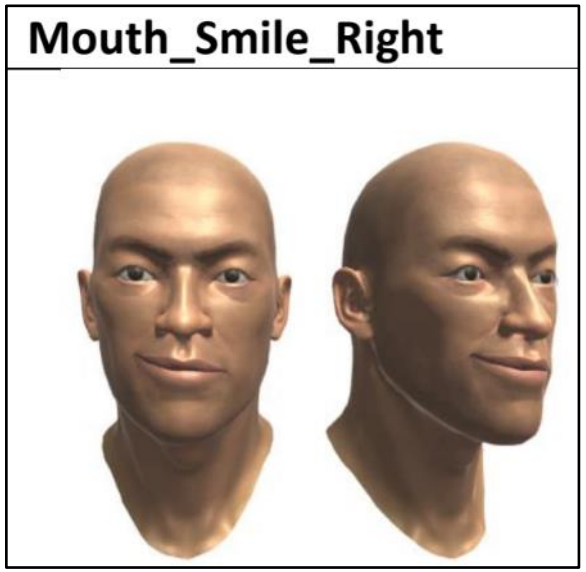


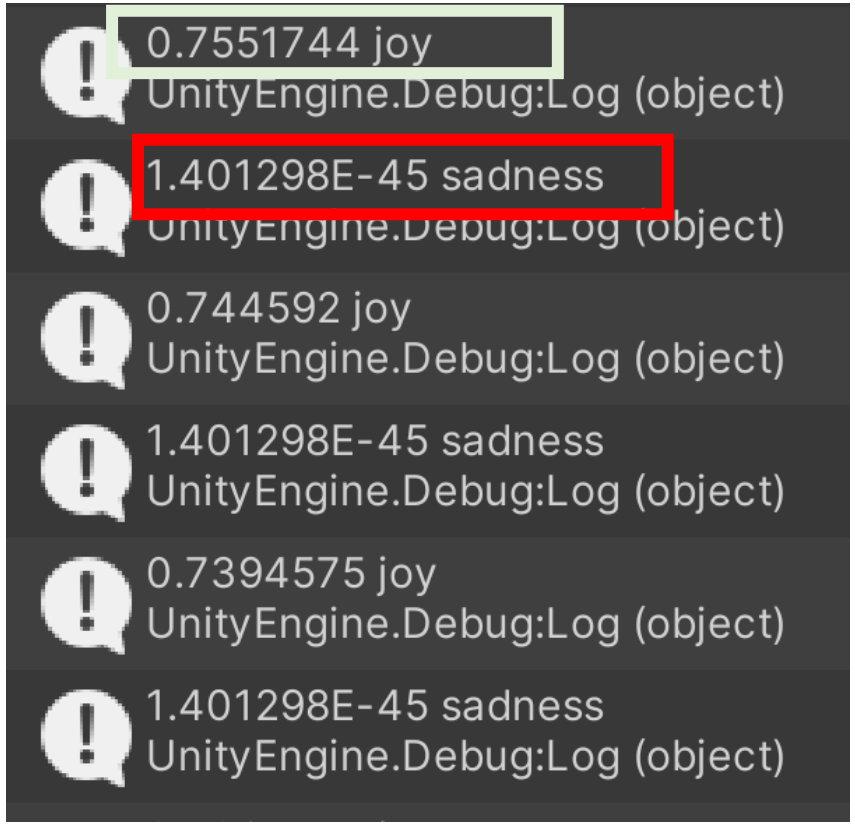
[2] National Research Council, Canada (NRC), which was contributed by Dr. Saif Mohammed

Cloud and software interaction

Recognize emotions from Face

	A	B
1	**Emotion**	**Lip Shape**
2	joy	Mouth_Smile_Right
3	sadness	Mouth_Sad_Left
4	anger	Cheek_Puff_Left
5	disgust	Mouth_UpperRight_Up
6	surprise	Mouth_O_Shape
7	fear	Mouth_Lower_Inside
8	trust	Cheek_Suck
9	anticipation	Mouth_Lower_Overlay

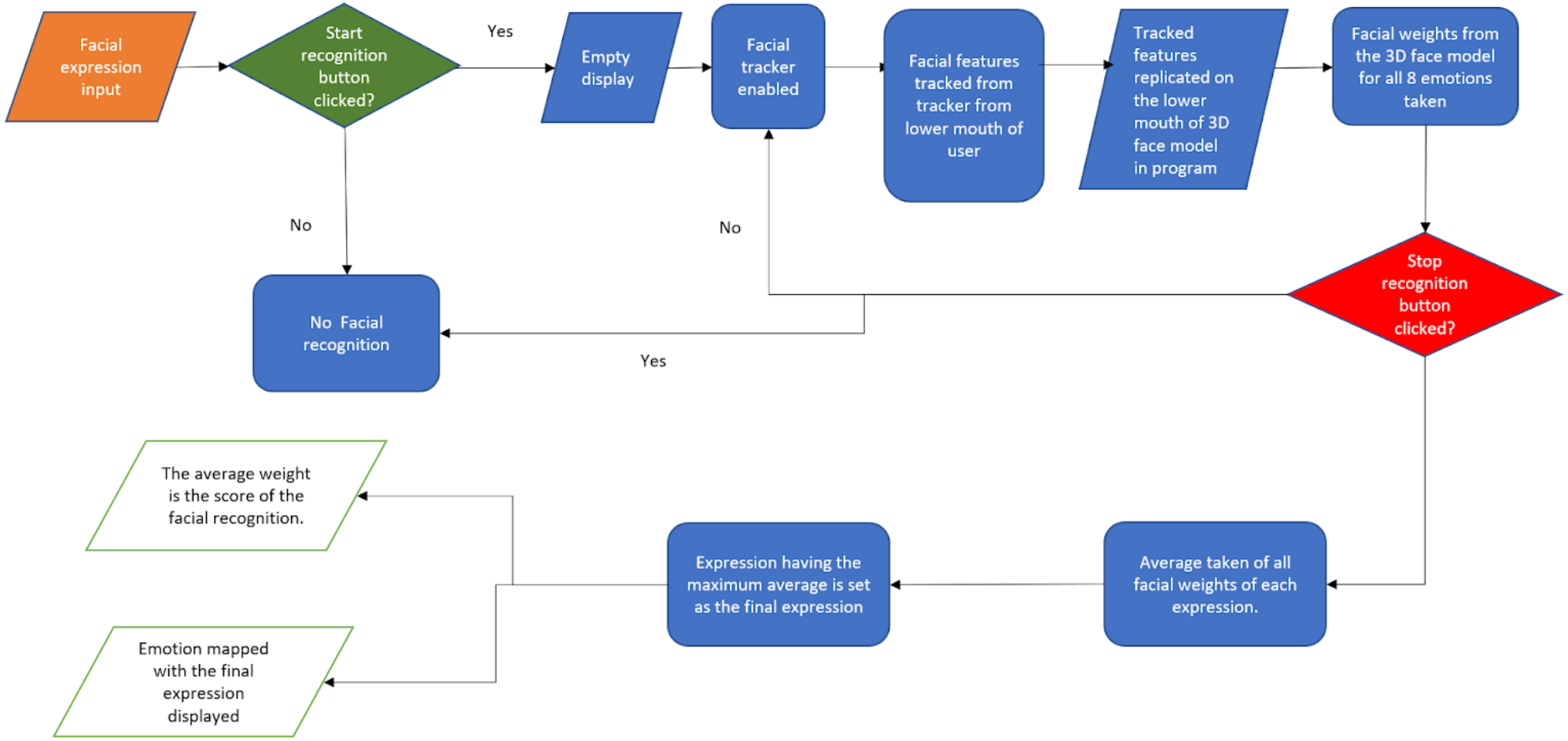




- ✓ Each Lip shape/expression is mapped with emotion and score is shown.
- ✓ Observation: The said “weights” of each facial expression is high in range [0.5,1) when similar expression is made.

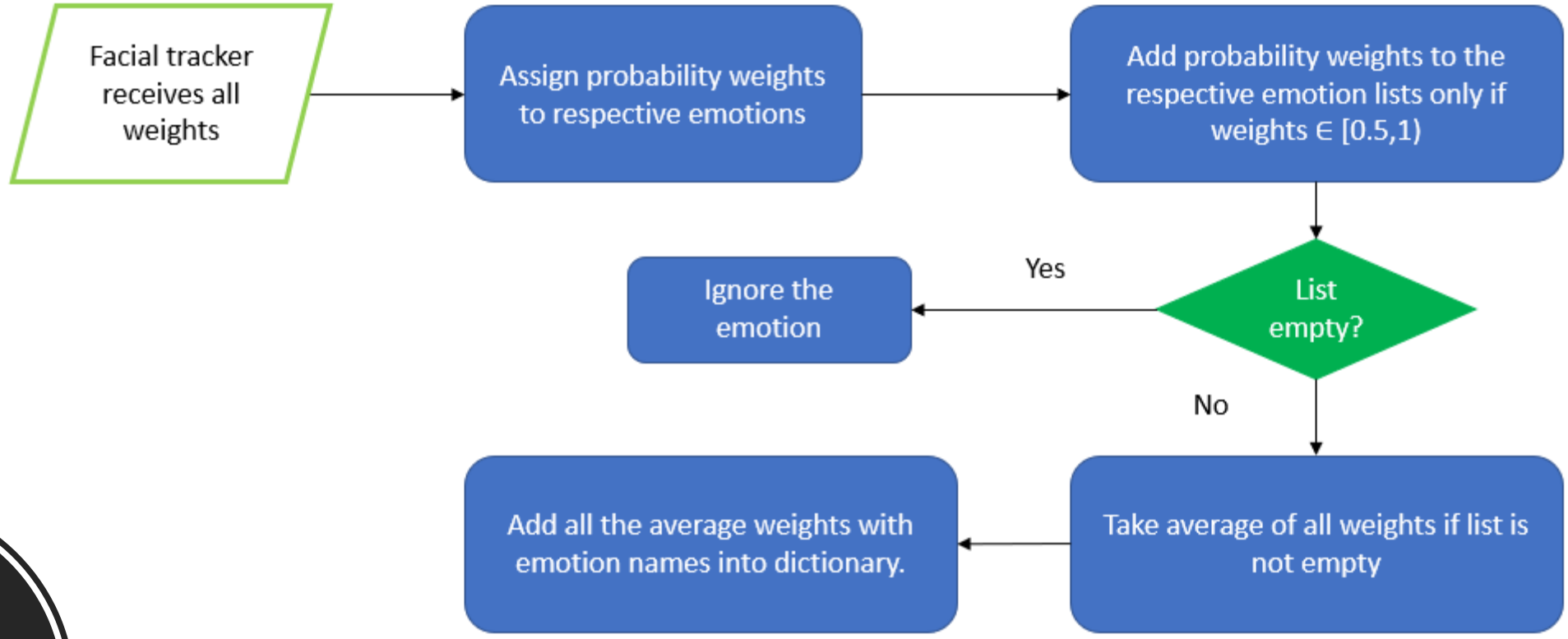
Mapping and weights of emotions with expressions

Recognize emotions from Face



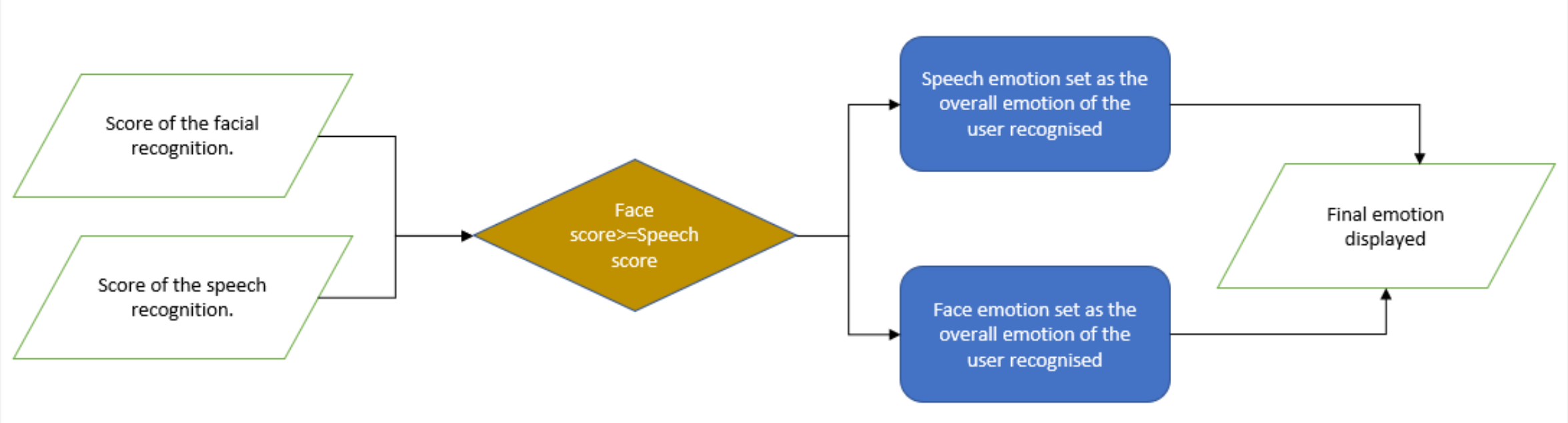
Emotional recognition from face in brief

Recognize emotions from Face



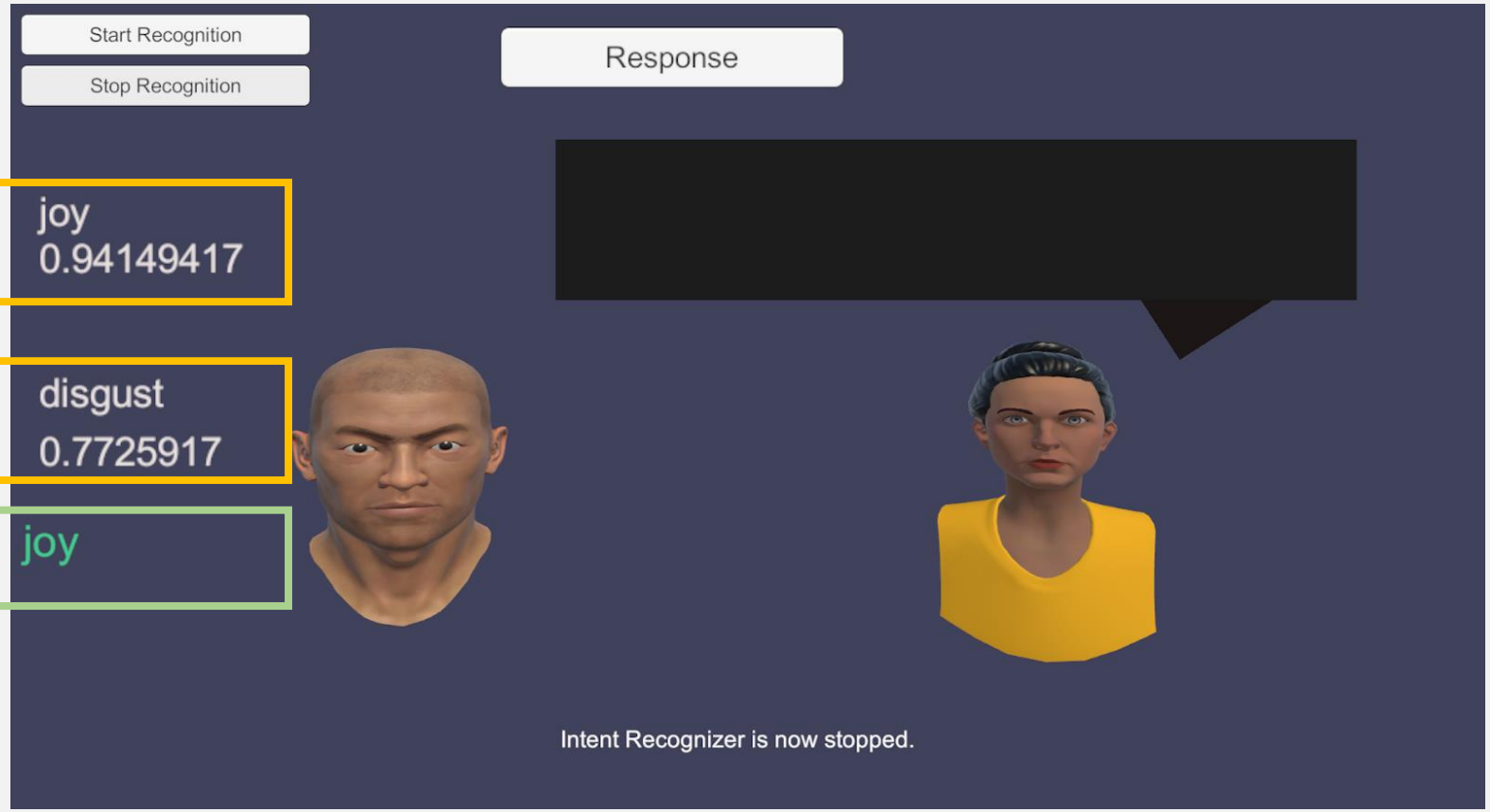
Algorithm to calculate facial weights

Return a suitable response in addition



Comparing scores, finalizing the emotion and displaying it

Return a suitable response in addition



Emotion from speech and speech score

Emotion from facial expression and face score

Final emotion displayed

Comparing scores, finalizing the emotion and displaying it

Return a suitable response in addition

Emotion from speech and speech score

Emotion from facial expression and face score

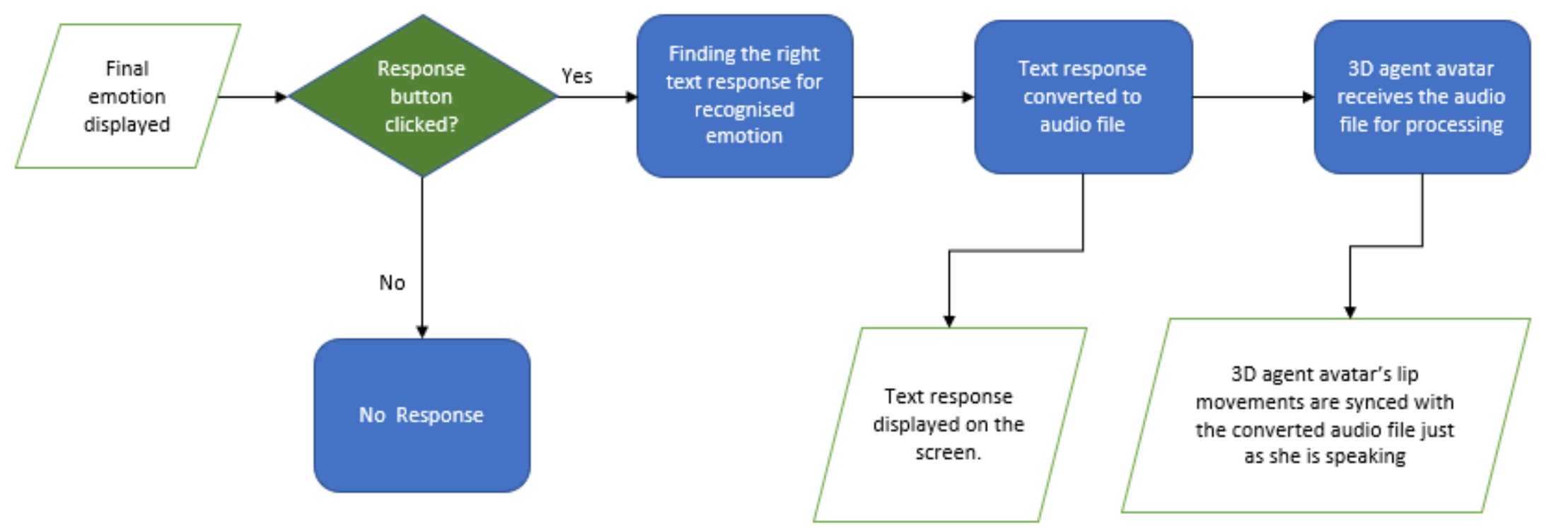
Final emotion displayed

Text response to corresponding emotion displayed

Text converted to audio response lip synced by 3D avatar

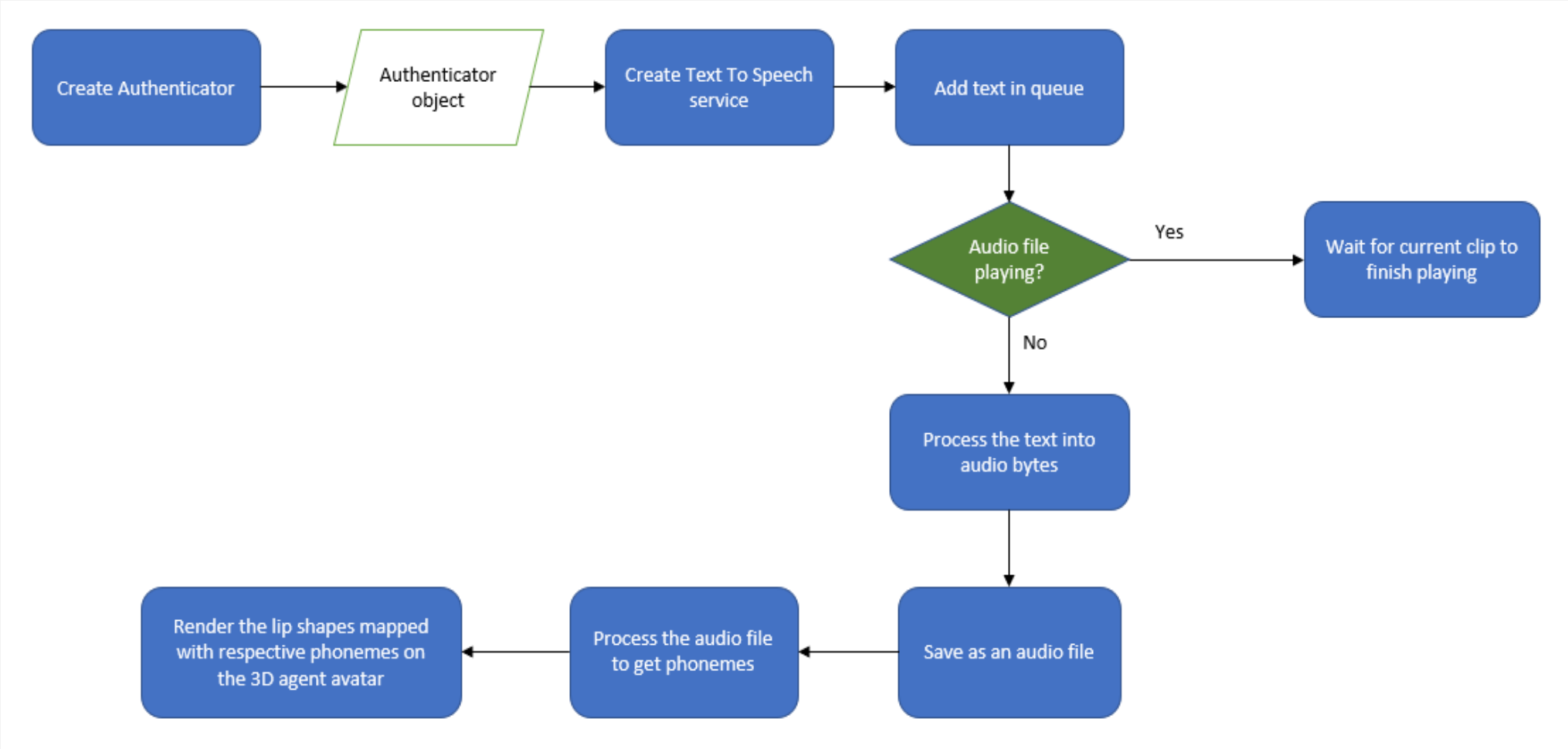
Comparing scores, finalizing the emotion and displaying it

Return a suitable response in addition



Return a suitable response as per emotion detected, in brief

Return a suitable response in addition



IBM Watson Cloud TTS conversion and lip sync with avatar

Demo Video

Demo Video Link Click here

Results

	A	B	C	D	E	F	G	H
1	**Emotion from words**	**Score of speech recognition**	**Emotion from face**	**Score of facial recognition**	**Sentence**	**Seconds of faci**	**Mixed faces?**	**Results**
2	joy	0.9600479	joy	0.8937796	I am ~~happy~~	30	Yes	joy
3	disgust	0.84636116	disgust	0.8114765	I am ~~disgusted~~	30	Yes	disgust
4	anger	0.9624286	disgust	0.7834183	I am ~~angry~~	20	Yes	anger
5	surprise	0.94713885	disgust	0.7885766	I am so ~~surprised~~	20	Yes	surprise
6	fear	0.8488961	disgust	0.6644828	I am ~~fearful~~	10	Yes	fear
7	fear	0.8830139	fear	0.8249102	I am ~~fearful~~	10	No	fear
8	sadness	0.9853371	sadness	0.7644198	I am so ~~sad~~	10	No	sadness
9	None		joy	0.867041	I am ~~pleased~~	10	No	None
10	joy	0.94149417	sadness	0.8577735	I am ~~joyful~~	30	No	joyful
11	joy	0.84636116	surprise	0.9341128	I am ~~joyful~~	30	No	surprise
12	None		anger	0.8587316	I am so ~~afraid~~	20	No	None
13	sadness	0.9853371	joy	0.9606678	I am so ~~sad~~	30	Yes	sadness
14	disgust	0.87616676	sadness	0.905396	I am so ~~disgusted~~	30	No	sadness
15	None		joy	0.9317733	I am ~~upset~~	10	No	None
16	None		disgust	0.8985522	~~Ewwww~~ that is so pathetic (Here, "Eww" is read as "You by program")	10	No	None
17	fear	0.8506737	joy	0.8848188	The subject is ~~psychological~~	10	Yes	joy
18	trust	0.8753927	sadness	0.8939628	I stand up for ~~equality~~	10	Yes	sadness
19	None		joy	0.7938358	write your names in ~~alphabetical~~ order	10	Yes	None
20	anticipation	0.8520406	joy	0.9134619	what is your ~~hobby~~	10	No	joy
21	disgust	0.7408477	anger	0.903406	I ~~strongly~~ recommend to study	10	No	anger
22	joy	0.9537616	disgust	0.8063838	I am interested to watch movies about ~~avengers~~	10	Yes	joy
23	sadness	0.7210067	sadness	0.9431221	Mirror ~~reflects~~ your face	20	No	sadness
24	surprise	0.8520406	surprise	0.8964818	The work is ~~flawless~~	20	No	surprise
25	anger	0.8548859	anger	0.9748615	what is the ~~price~~ of this item	20	No	anger
26	joy	0.6618941	joy	0.918696	there is ~~stillness~~ in water	20	No	joy
27	disgust	0.722674	disgust	0.9073125	the world is ~~applauding~~ the genius	10	No	disgust
28	fear	0.8540822	fear	0.8579254	take your ~~medicines~~ -from pharmacy	30	No	fear

Before adding 0.1 to face score

Unrecognised, as word not in database

After adding 0.1 to face score

incorrect recognition by program

Should be recognised as “anticipation”, but gone unnoticed

“avengers” an emotion of joy

“price” an emotion of anger

“applauding” an emotion of disgust

Impact

VR environment-alternative environment for self expression and understanding by the virtual agent.

Facial expressions also considered, instead of just speech as only channel.

Biggest impact- provide a *new solution* and *direction* in the ongoing research of affective awareness agents.

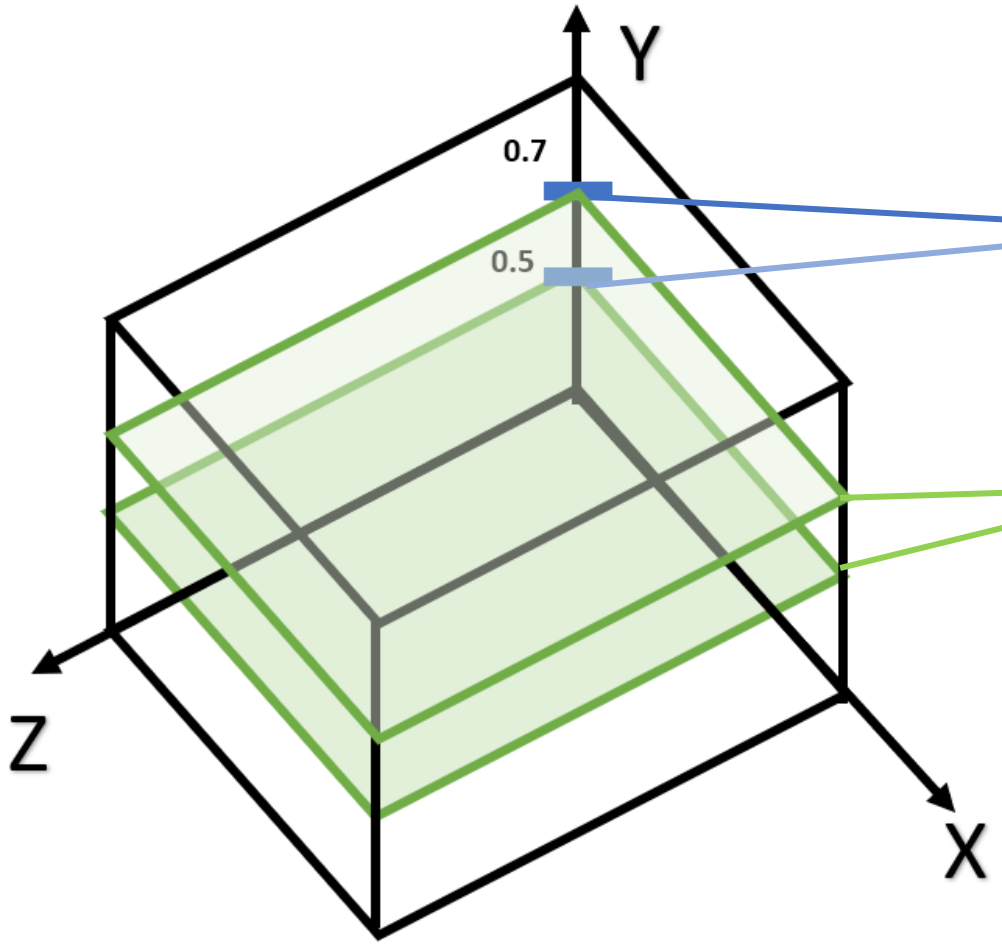
Future improvements

	Limitations	Improvements
2	**System limitation**: LUIS accepts 1000 words for each keyword in entity.	Provided feedback, waiting for system update
3	**Lexical analysis**: "I am not sad"- "sadness" emotion detected due to keyword "sad"	Use sentiment analysis using full sentences. Unity's Python package used, which is now under further developement
4	**Probability weights for face**: Taking the highest average weighted expression, ignores other expressions. Ignorance of "mixed feelings".	Use continuous facial recognition to take into consideration other facial expressions.
5		Tone analysis
6		Make project like a dynamic chabot
7		More variety of actions other than Lip sync response, like a fantasy game.

Existing limitations

Good to have features

Discussion



Y=[0.5 , 0.7] : Range for “joy” emotion

Planes enclosing regions for “joy” emotion

- ✓ Plot data extracted from speech and facial recognition both in 3D space to find the overall emotion, instead of comparing the confidence scores.
- ✓ More accurate- multi modal analysis, as an overall output is provided instead of considering only the higher weighted one.

Questions-Answers

Thank you, let’s immerse in VR!