Cairo University

Faculty of Computers and Information

AI312: Reasoning and Knowledge Representation

Facial Recognition Mini-Project

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The defined linguistic variables and terms:

Multi linguistic variables were extracted: hair, moustache, and vision sensor, Eye, Nose, Teeth, Lips, Forehead, Eyebrows, cheeks, chin. Information about hair and moustache is extracted directly from the Part Labels database.

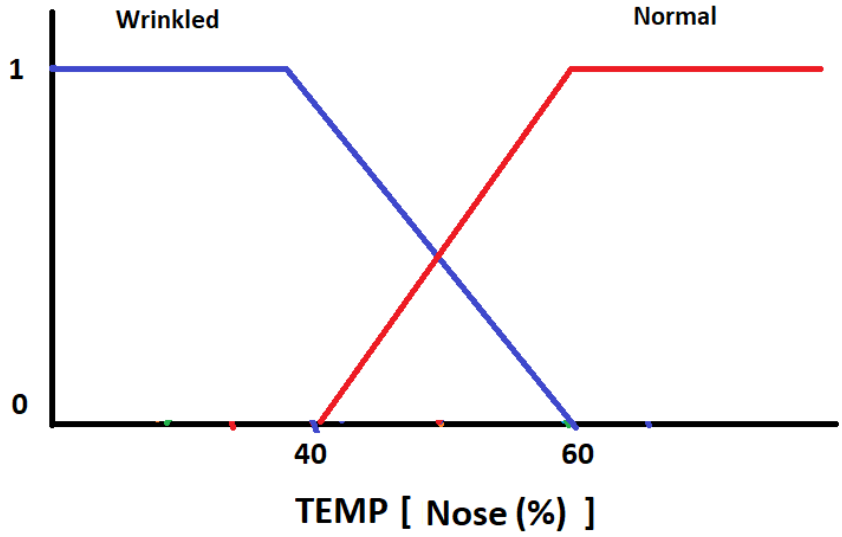
Outputs: Facial expression containing:

- Anger
- Disgust
- Sad
- Normal
- Happy
- Surprise
- Fear

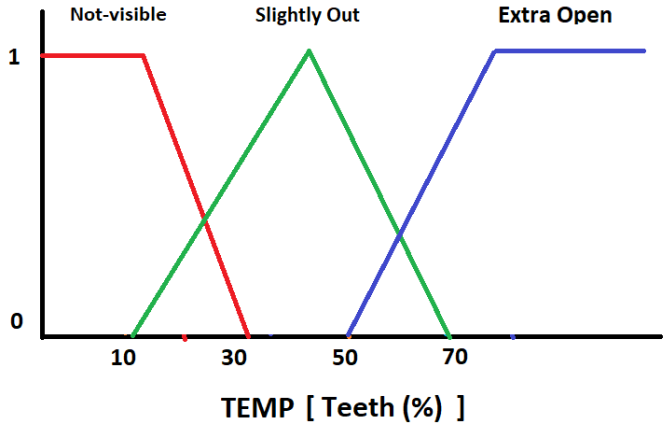
Knowledge base layout

The Membership Function of

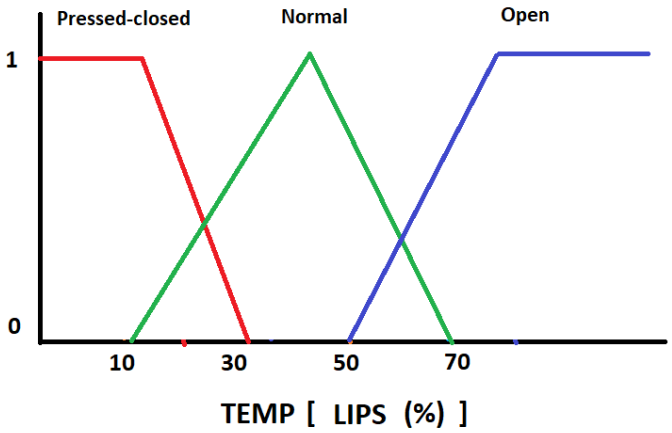
1. Nose:



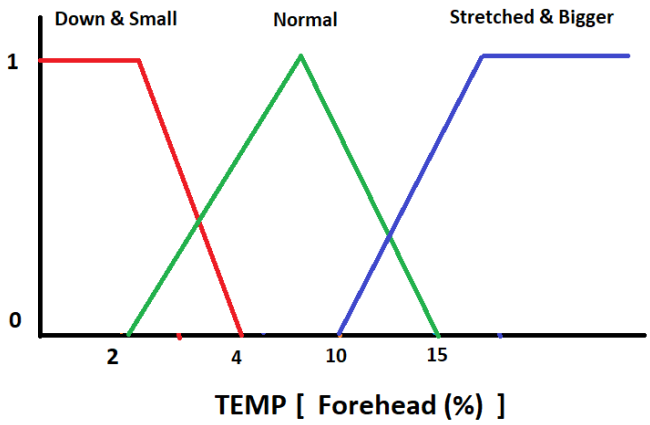
2. Teeth:



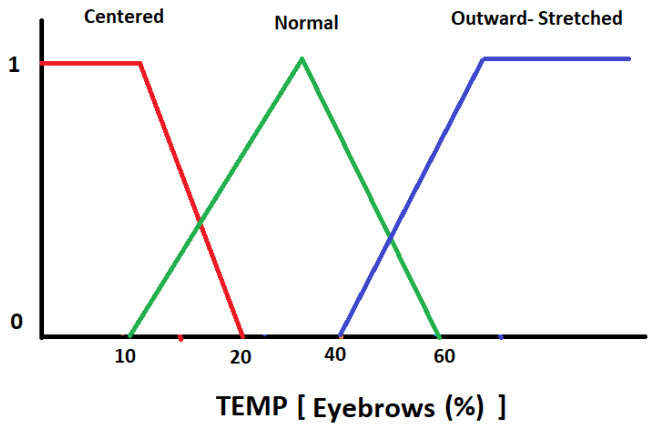
3. Lips:



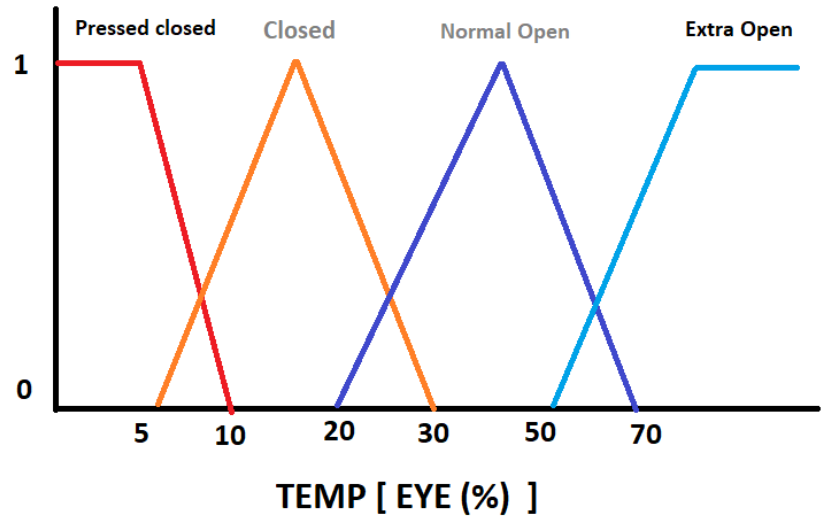
4. Forehead:



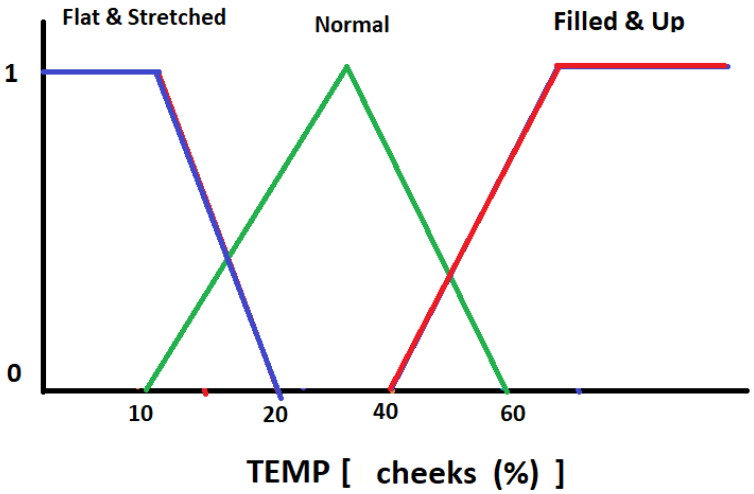
5. Eyebrows:



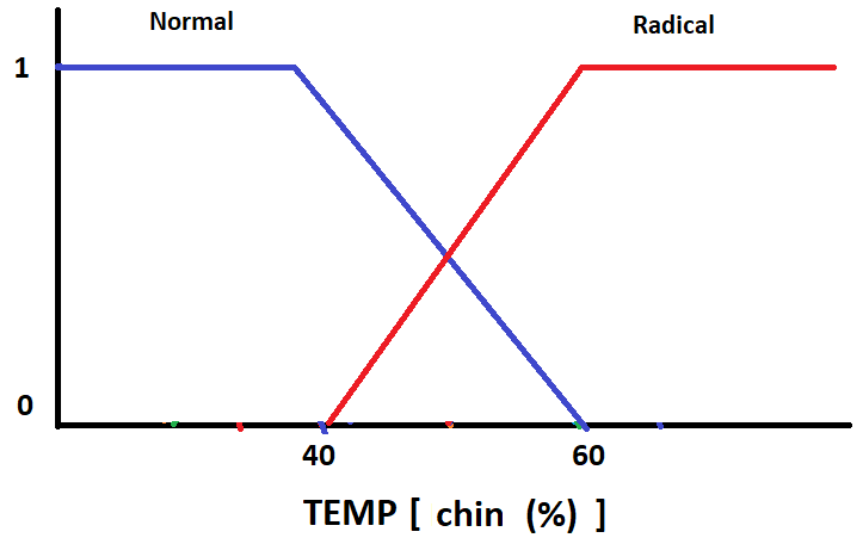
6. Eye:



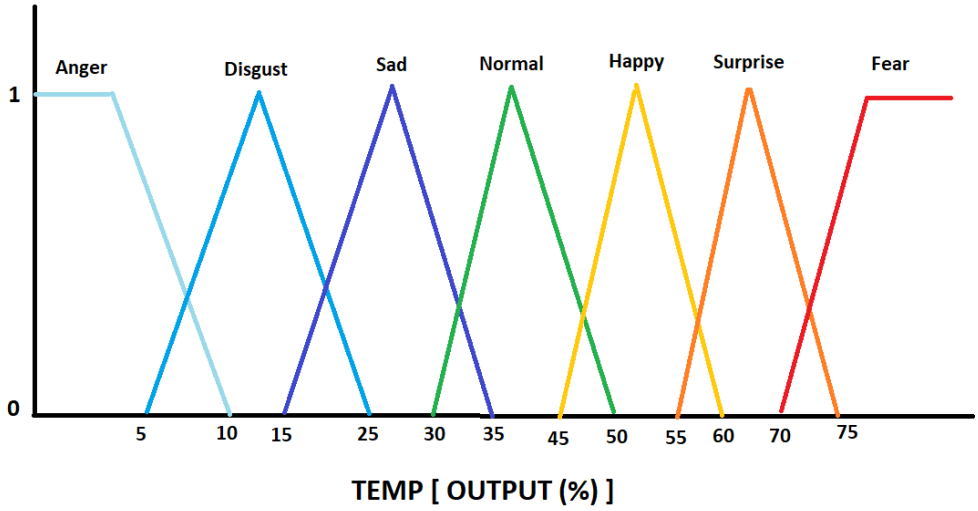
7. Cheeks:



8. Chin:



9. Outputs:



Knowledge base content/rules:

Base of knowledge: consists of an MFs-specified rule and database. The basis of the rule is a number of IF-THEN rules. An implication fugitive is also called a rule with a precedent and an impact. The database consists of a collection of MF's both methods of fuzzification and defuzzification

- **If cheeks Up ∧ Teeth Slightly Out ∧ Lips open Then Happy**
- **If Eyebrows Centered ∧ Lips Normal ∧ cheeks Flat Then Sad**
- **If Eyebrows Centered ∧ Lips Pressed-closed ∧ cheeks Flat ∧ Teeth Not-visible Then Angry**
- **If Eye extra open ∧ Lips open ∧ Eyebrows Outward-Stretched Then Surprise**
- **If Eyebrows Normal ∧ Lips Normal ∧ cheeks Flat ∧ Eye Normal open Then Normal**
- **If Eyebrows Outward-Stretched ∧ cheeks Normal ∧ Eyes Extra-open ∧ Lips Open Then Fear**
- **If Eyebrows Centered ∧ cheeks Up ∧ nose wrinkled Then Disgust**

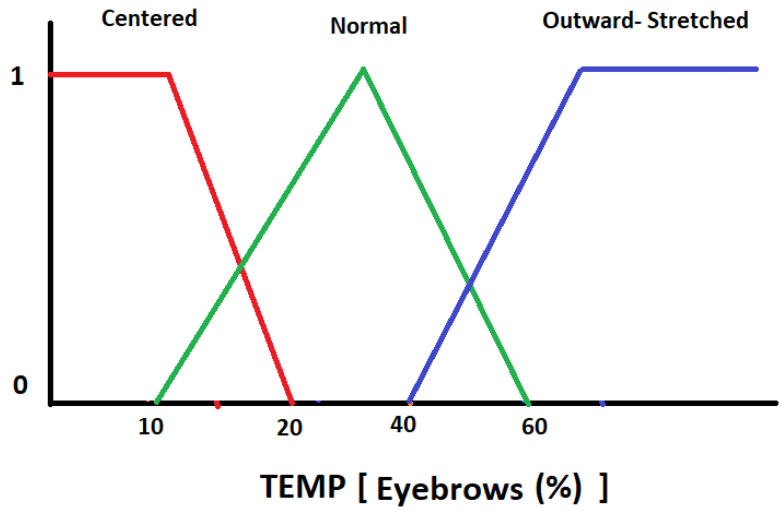
Description of the fuzzification process:

First, we will apply a feature extraction method that will convert all images to numerical inputs

Then, we use membership function to convert all linguistic variables to fuzzy variables.

In this process we will create function for each variable that contains 2 or 3 arrays each array contains values from 0 to 1 and start from 0 to the end of the end of the situation

Example



For this function we will create 3 arrays

First is centered start from 0 to 19 and contains 1 from 0 to 9 then decreased to 0

Second is normal from 0 to 49 and contains 0 in first then increase etc

Then we will use the value to get all numbers from arrays then return it

Description of the inference algorithm the you will apply in your inference engine:

Mamdani inference

After fuzzification we will use fuzzy variables in database rules to make a decisions

Illustrate the cases needed to apply a combination of more than one rule (aggregation):

no rules need to apply combination

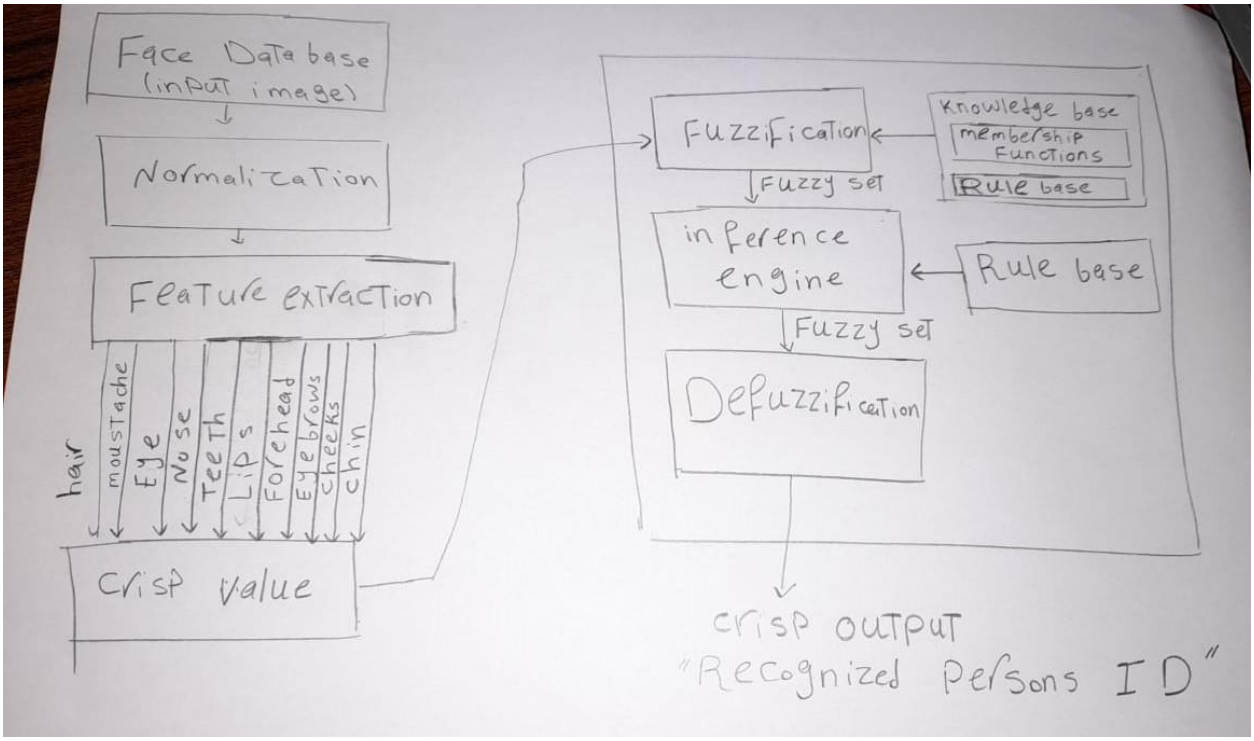
Description of the defuzzification component that convert the output data into nonfuzzy values:

we will use weighted mean

we will calculate means of output then we will use this rule

$$x = \frac{\sum \ variable\ value * varible\ mean}{\sum \ variable\ value}$$

Architecture diagram illustrating the main components of the designed project



Task distribution table

Eslam Nasser Abdelqader	Defuzzification
Ahmed Mohamed Abdel-Rashied	Fuzzification
Ahmed Rushdi El-Kilany	Fuzzy inference