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A Mini-Project On

Air Conditioner Controller using Fuzzy Logic

SUBMITTED BY

Aakash Chavan 4218
Sneha Chavan 4219

Under The Guidance of

Prof. R. A. Kulkarni

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Abstract:

Fuzzy logic is widely used in machine control. The term "fuzzy" refers to the fact that the logic involved can deal with concepts that cannot be expressed as the "true" or "false" but rather as "partially true". Although alternative approaches such as genetic algorithms and neural networks can perform just as well as fuzzy logic in many cases, fuzzy logic has the advantage that the solution to the problem can be cast in terms that human operators can understand, so that their experience can be used in the design of the controller. This makes it easier to mechanize tasks that are already successfully performed by humans.

Keywords: Fuzzy Logic, Fuzzy Control Systems

Mini Project on the Air Conditioner Controller using Fuzzy Logic

Contents

List of Figures

1 INTRODUCTION

The term fuzzy refers to things which are not clear or are vague. In the real world many times we encounter a situation when we can't determine whether the state is true or false, their fuzzy logic provides a very valuable flexibility for reasoning. In this way, we can consider the inaccuracies and uncertainties of any situation.

In the boolean system, truth value, 1.0 represents absolute truth value and 0.0 represents ab-solute false value. But in the fuzzy system, there is no logic for absolute truth and absolute false value. But in fuzzy logic, there is intermediate value to present which is partially true and partially false.

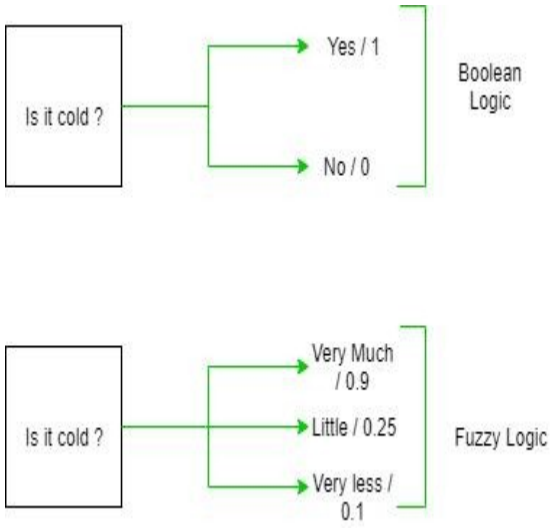

Figure 1: Fuzzy Logic

Architecture

Its Architecture contains four parts :

RULE BASE: It contains the set of rules and the IF-THEN conditions provided by the experts to govern the decision making system, on the basis of linguistic information. Recent developments in fuzzy theory o er several e ective methods for the design and tuning of fuzzy controllers. Most of these developments reduce the number of fuzzy rules.

FUZZIFICATION: It is used to convert inputs i.e. crisp numbers into fuzzy sets. Crisp inputs are basically the exact inputs measured by sensors and passed into the control system for processing, such as temperature, pressure, rpm's, etc.

INFERENCE ENGINE: It determines the matching degree of the current fuzzy input with respect to each rule and decides which rules are to be fired according to the input field. Next, the fired rules are combined to form the control actions.

DEFUZZIFICATION: It is used to convert the fuzzy sets obtained by inference engine into a crisp value. There are several defuzzification methods available and the best suited one is used with a specific expert system to reduce the error.

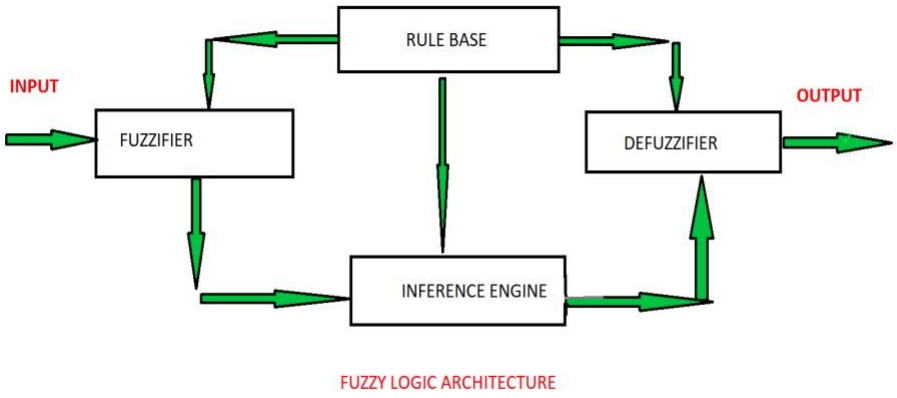

Figure 2: Fuzzy Inference System

Membership Function

A graph that defines how each point in the input space is mapped to membership value between 0 and 1. Input space is often referred to as the universe of discourse or universal set (u), which contain all the possible elements of concern in each particular application.

There are largely three types of fuzzifiers:

Singleton fuzzifier

Gaussian fuzzifier

Trapezoidal or triangular fuzzifier

Fuzzy Control

It is a technique to embody human-like thinking into a control system.

It may not be designed to give accurate reasoning but it is designed to give acceptable reasoning.

It can emulate human deductive thinking, that is, the process people use to infer conclu-sions from what they know.

Any uncertainties can be easily dealt with the help of fuzzy logic.

1.1 Objective

To develop an Air Conditioner Controller using Fuzzy Logic.

1.2 Scope

Fuzzy logic is used in Natural language processing and various intensive applications in Artificial Intelligence.

Fuzzy logic is extensively used in modern control systems such as expert systems.

Fuzzy Logic is used with Neural Networks as it mimics how a person would make de-cisions, only much faster. It is done by Aggregation of data and changing into more meaningful data by forming partial truths as Fuzzy sets.

2 RESULTS

2.1 Input Membership Functions

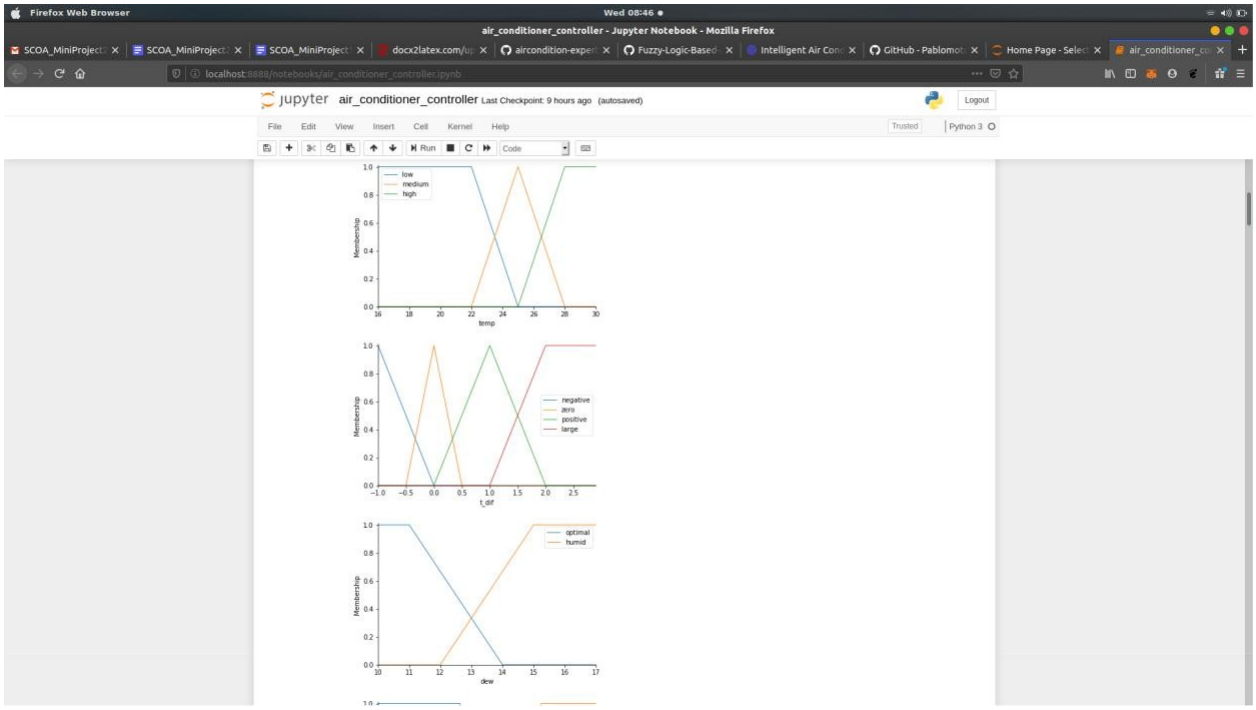

Figure 3: Input Membership Functions

2.2 Output Membership Functions

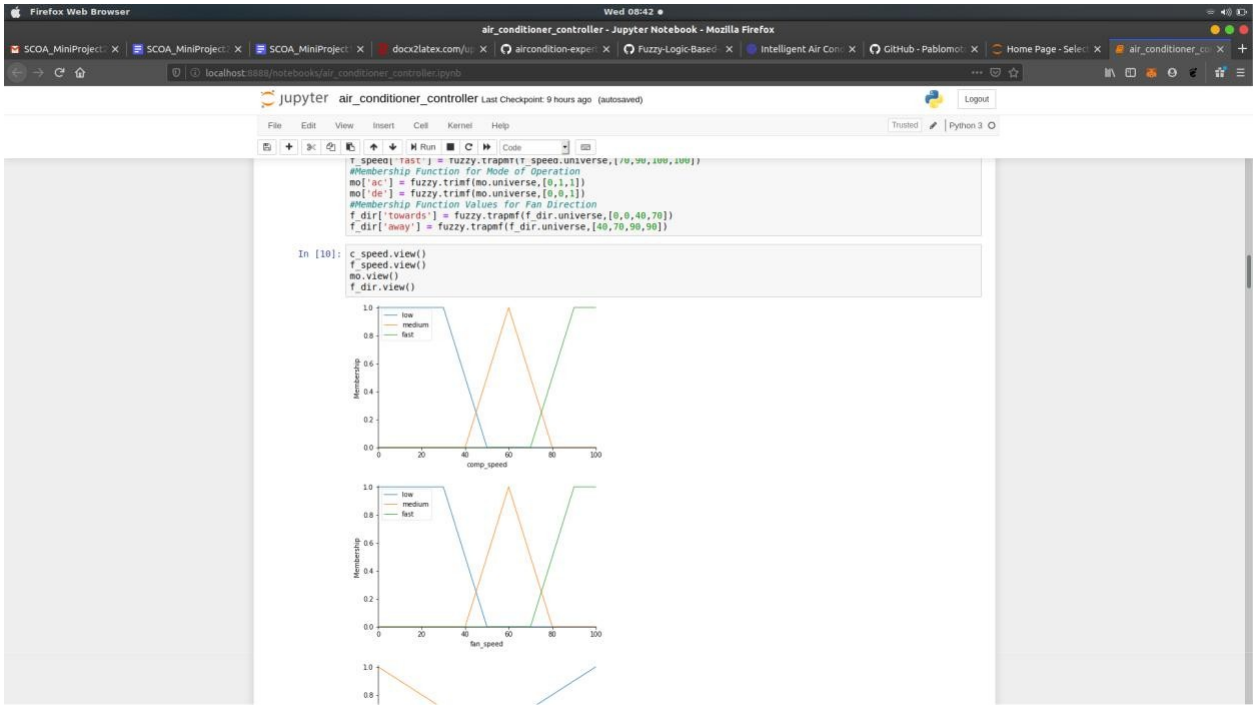

Figure 4: Output Membership Function-1

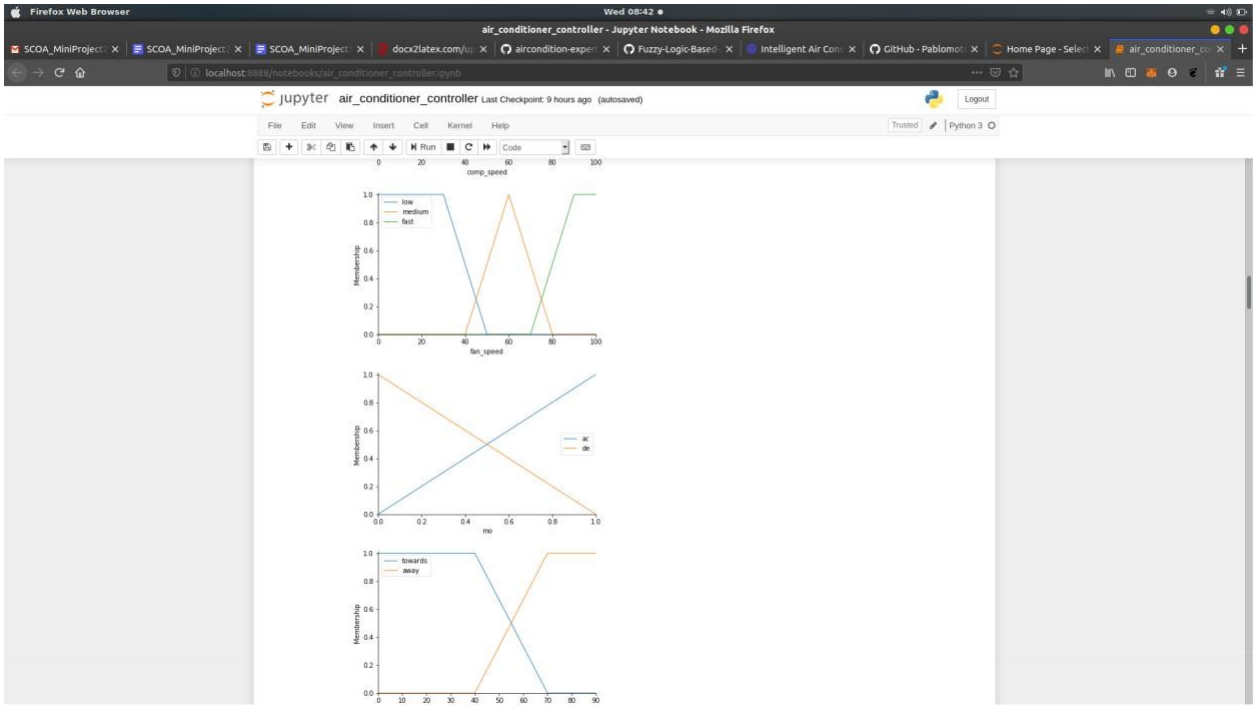

Figure 5: Output Membership Function-2

2.3 Output

Input - (Temperature = 29, T_Di = 1.3, Dew = 15, Volt = 209)

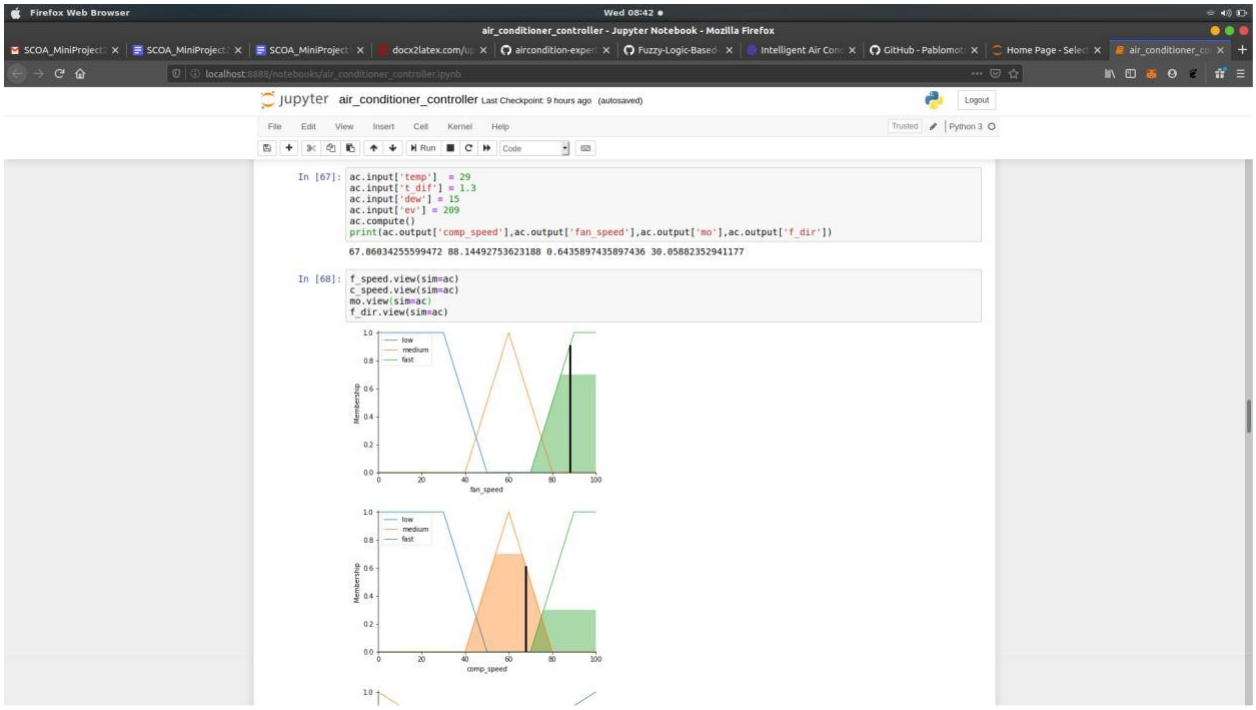

Figure 6: Output-1

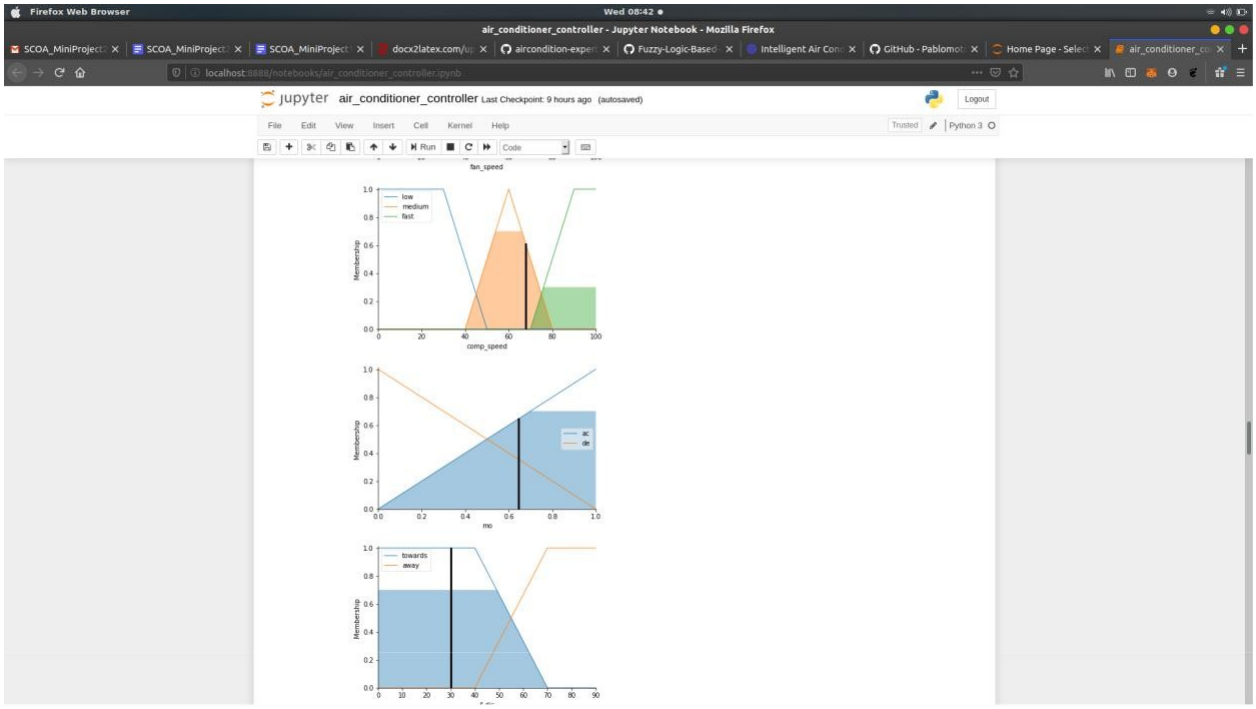

Figure 7: Output-2

Input - (Temperature = 17, T_Di = -0.9, Dew = 11, Volt = 159)

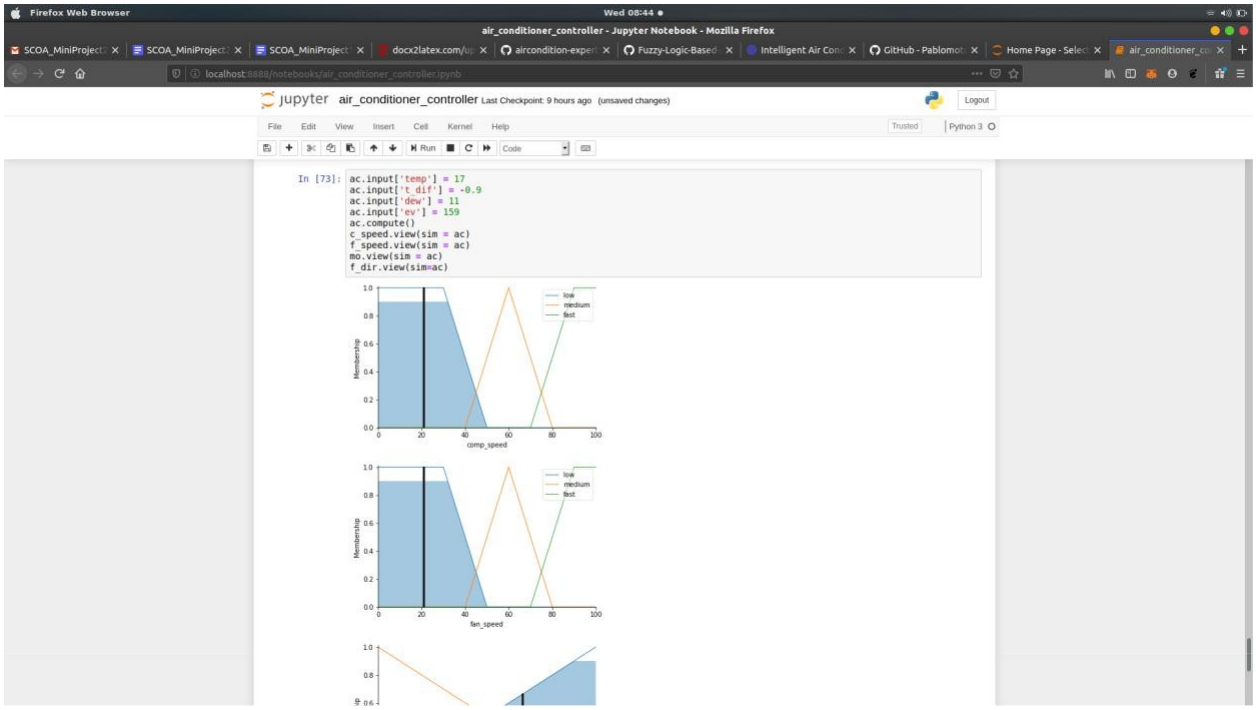

Figure 8: Output-3

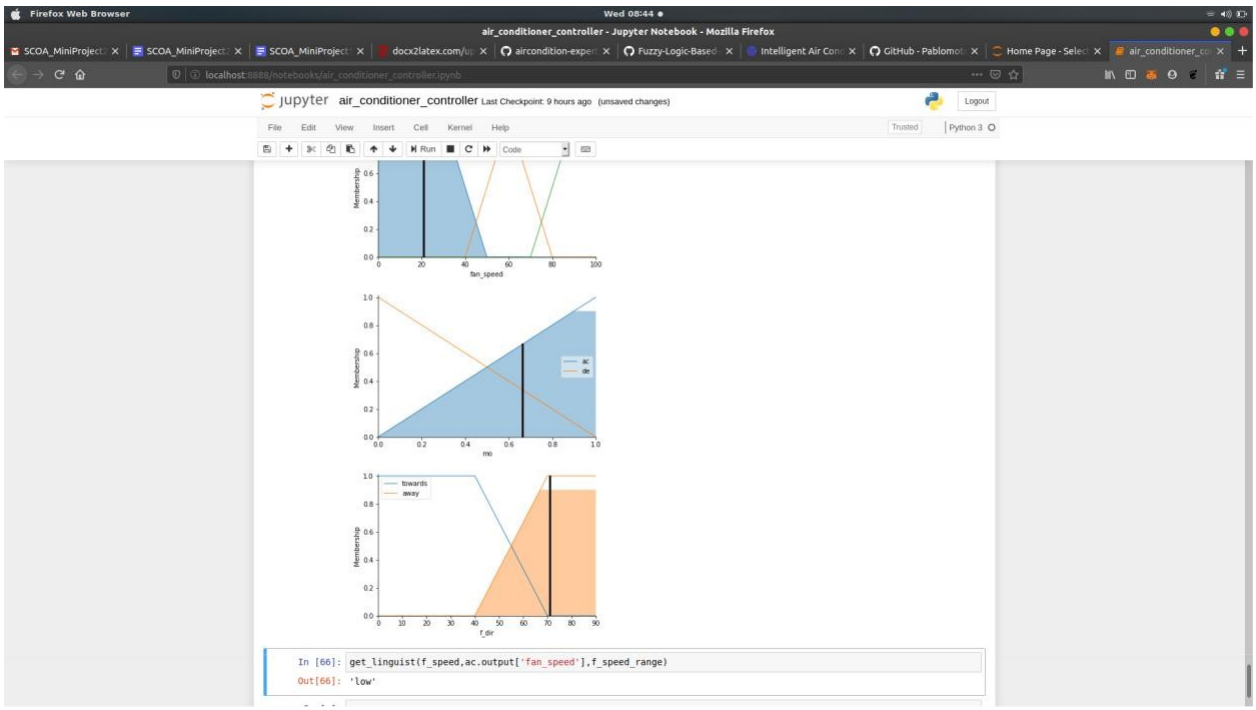

Figure 9: Output-4

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3 CONCLUSION

We have successfully built an Air Conditioner Controller using Fuzzy Logic.

4 REFERENCES

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