Automation of Domestic Flour Mill Using Fuzzy Logic Control

Introduction:

A Domestic flour mill is a machine used to gride different types of grain and obtain different flour from it. The machine is basically a grinder with a huge external AC motor attached to it with a rotator belt. It has a few knobs and livers in order to control the required quality of flour with respect to the type of grains. Automation is one of the emerging technologies in the field of any industrial processes. This paper emphasis on the automation of a domestic flour mill using fuzzy logic. As fuzzy logic have various potential functions, this can be utilized in flour mill automation. In this paper an idea is proposed for the Range of grinding process as it helps to operate in optimal speed and saving electricity. Fuzzy Logic Controller (FLC) improves the performance compared to a conventional PID controller as well. In this paper a comparison of PID and Fuzzy Logic Control was also performed and it is proved that FLC has better response and less overshoot. Also it is free from oscillations present in transient period. The simulation was carried over by using MATLAB/SIMULINK. Introduction of Flour Mill: A flour mill is a small scale machine which is used to grind different kinds of wheat PID and Fuzzy Logic Controller: The paramount need of and other starchy plant foods. Flour mills can be any automation industry is speed control. There are established at different levels like domestic, commercial, various methods adopted for the speed control. One such mini and roller flour mill. Milling machinery consist system speed control method is using conventional control components of feeding, grinding, separating husk and methods like PID. In this paper speed control is performed flour and power handling system. The flour mill processes using PD, PID and FLC.PD and PID has very simple the wheat to edible wheat flour. The four main stages of structure but the response is less fast as compared with flour production are, a) conditioning of wheat feed using FLC. FLC is used to embroider the response and time multiple hoppers. b) Cleaning of seed by separating the domain parameters and the comparative analysis also bran c) grinding of seeds using chilled cast iron roller proves the same. blades and d) finally the flour is sieved and segregated. Physical processes are largely based on human The segregated product goes for packing. The reasoning which is imprecise. Moreover they cannot intermediate goes to purifier machine and rest goes to solve a problem like milling machine components to the roller mill for further grinding and separating. The roller accuracy of micron meters. Fuzzy logic mimics how a mill is generally vertically shaped so that it the material person would make decisions. FLC is utilised in complex, circulates through iron roller blades rather than ill-defined, nonlinear processes where human reasoning spinning. Roller mill is placed on a base which consists of has the edge over mathematical models. An ordinary set a motor for turning the roller blade and has control on its (crisp set) has only two membership values 0 and 1 while surface. The space between the rotating roller blades are fuzzy logic allows intermediate truth values between zero adjusted to get the consistency as desired by the and one. An assertion can be more or less in fuzzy logic. customer. To separate endosperm of the grain from bran To design any conventional classical or modern control and germ the roller mill which are highly

powered are system, it is necessary for an accurate mathematical model used. Then it is crushed and grinded to fine flour of the plant to be controlled. However in many cases this particles. is not possible because of the complexity of the In recent years the domestic floor mill is operated processes. Thus fuzzy logic is used in control system and manually. Operating the domestic floor mill is being design analysis as it incorporates simple, rule-based carried out manually. In this paper a new method is approach rather than a mathematical model. The first step removes the manual operation.

SIMPLIFIED DESIGN ALGORITHM FOR AUTOMATION OF FLOUR MILL:

This simplified design algorithm is used to design the fuzzifier, rules, defuzzifier for

Automation Grinder system according to the control strategy of the Grinder to achieve the better and effective Range (Speed) of Grinding. The design uses three membership functions equally divided over a scale range of 0 to 100 for the **Quantity**, **Material Type**.

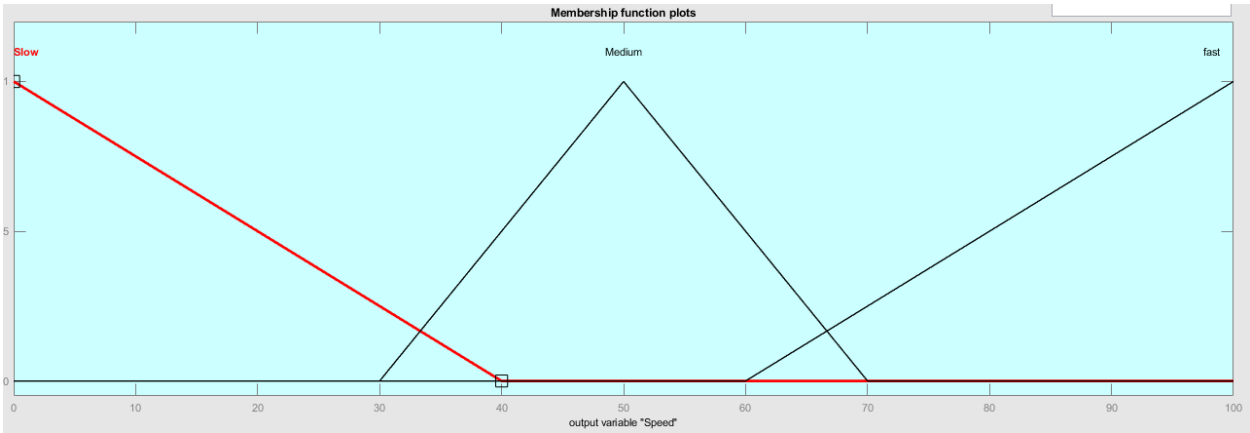
The output of this proposed system is **Range**. The membership function for

Range (Speed) of Grinding as:

Speed I(Slow) 0-35,

Speed II(Medium) 30-75,

Speed III(Fast) 65-100



The fuzzifier uses the data of two input variable, “**QUANTITY**”, “**MATERIAL TYPE**”. The

membership function and range are given in the table.

Table 1: Membership function and range of input variable QUANTITY (in kg)

Membership function	**Range**

Small	0-40
Moderate	30-70
Large	60-100

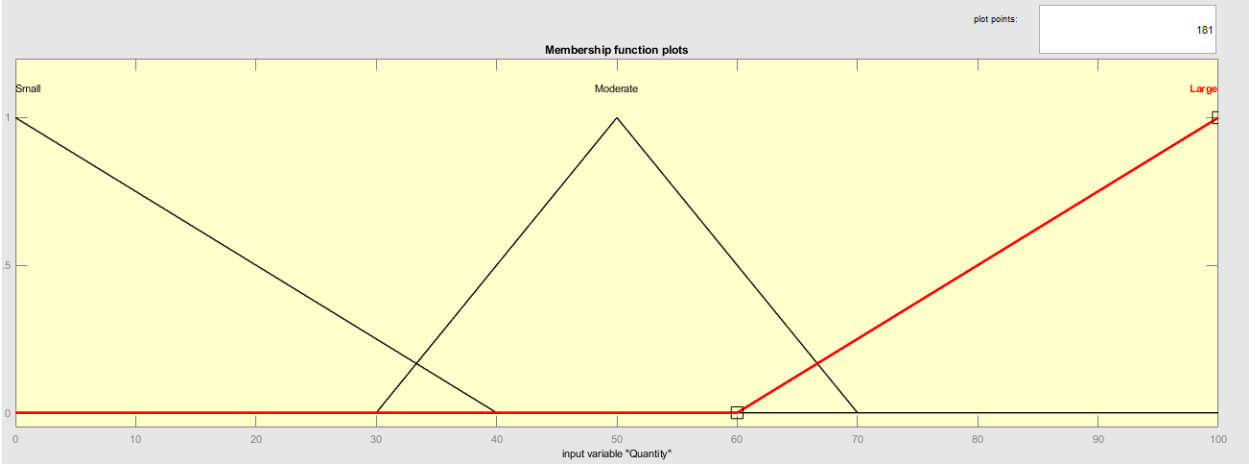
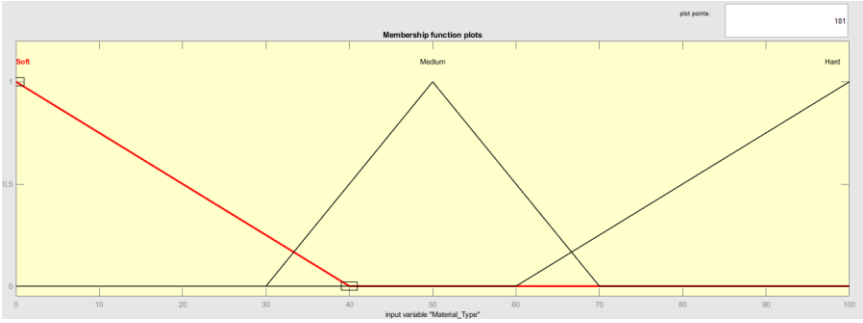


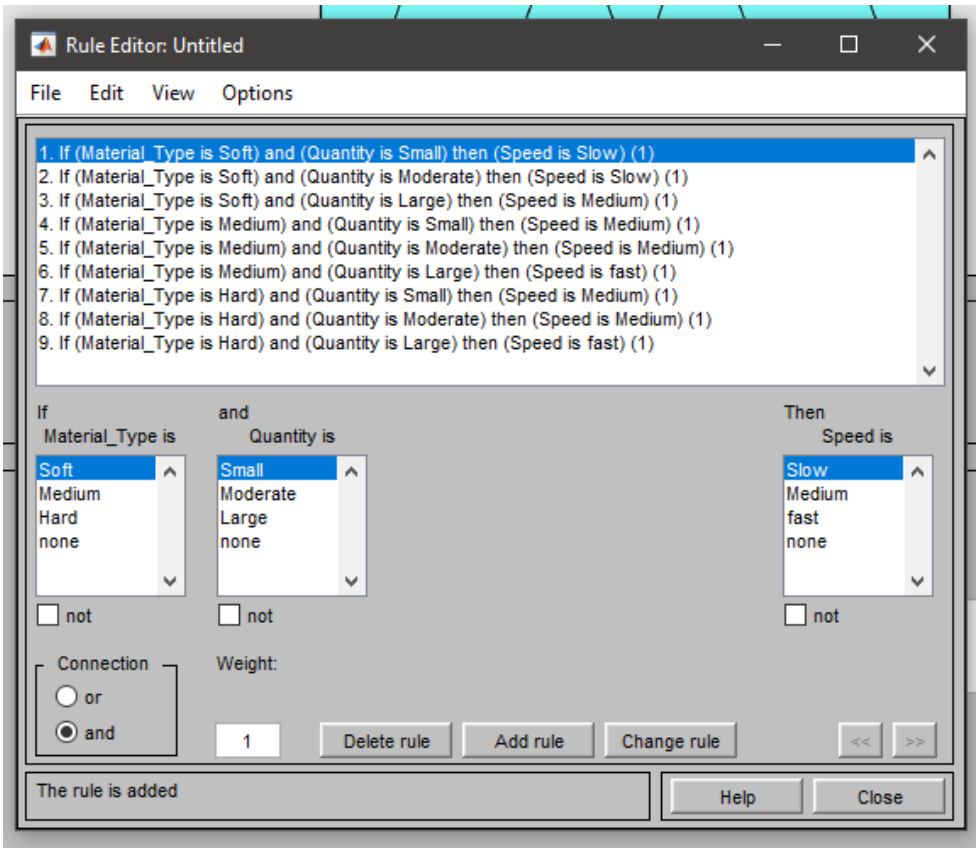
Table 2: Membership function and range of input variable MATERIAL TYPE (in %)

Membership function	**Range**
Soft	0-40
Medium	30-70
Hard	60-100



Rules:

These followings are the derived set of rules which are made considering the output which we need.



V. RESULT AND CONCLUSION

Here in the above picture shown we can see that with 60% input for material type and 70% input in quantity type we are getting the speed as 82.6 which falls under the category of **fast** which is correct so hence we can say that the derived fuzzy logic works properly.

Furthermore the utility of the proposed system is help to operate the Flour mill at safer speed, so one can use Flour mill without having knowledge of internal construction and technical knowledge of Flour mill. With this, we can increase the life of Flour mill and save electricity as it operated on its optimal speed. In future it will help to design the advanced control system for Mixture, Flour Mills taking other parameters and other various Grinding devices generally used in industrial applications at large scale.

Name: ABHAY VAISHNAV

Course: INT246 Soft Computing

Reg NO: 11804793

GITHUB

https://github.com/abhayvaishnav/Automation-of-Domestic-Flour-Mill-Using-Fuzzy-Logic-Control