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Smart fuzzy logic without complex integrated circuits

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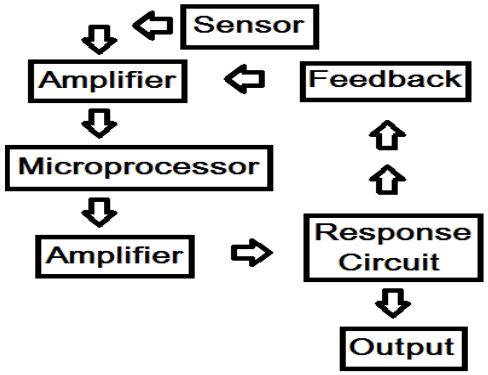
Abstract
Idea is to create a fuzzy logic without any microprocessors, controllers and programming to eliminate complexities in designing Artificially Intelligent Circuit. Generally, we use response circuit to generate an intelligent response which intakes signal data from sensors (low voltage) and use pre-designed logic circuits and processors to create a stimulus response that drives electro mechanical devices. This process sometimes also uses feedback circuits to modify the data signal from the sensor and act accordingly to create a flexible useful output, this improves the efficiency of the circuit that finally makes the circuit Artificially Intelligent. These intelligent circuits generates fuzzy logics using feedback improved input signals. The problem with these circuits is that they are so complex that they cannot be confined into a single field of study. Designing of these circuits also includes complex programming that limits the economy and flexibility of applications. The main challenge in designing of these circuits is to develop a method that can reduce complex programming and which could open the doors for a new generation of simple but clever circuits.

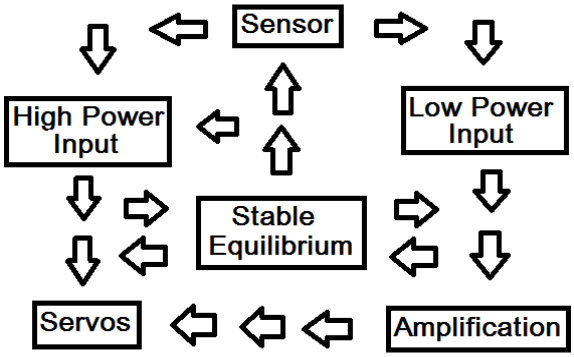
Keywords: Fuzzy Logic, Integrated Circuits, Smart Circuits, Electric Sensors, Signal Interpretation, Artificial Intelligence.

1. Introduction
Solution to overcome the problem of creating a fuzzy logic without using any Integrated Circuit is to use high power operating sensors that can maintain a stable equilibrium as to make circuit accordingly intelligent and self-reliable, without any output processing devices (IC & Microcontrollers). The input from the sensors will be integrated with electromechanical devices that are designed in such a way that to stay in a state of Stable Equilibrium, any changes in the state of sensor or surrounding will give rise to a resisting potential that will control the electromechanical device which will be able to achieve the equilibrium state. This circuit designing which include position of sensors with respect to the stimulus (act as a source) and a specific power distribution circuit to the response devices.

2. Response of AI
The following representation shows the response mechanism of a typical Artificial Intelligent Circuit. It works as the signal is taken as an input from a sensor device. The signal is then amplified to the working range of the microprocessor. Data is then processed based on the predefined logics and the signal is again amplified to the working range of response circuit. The output is feed to the Electromechanical Devices and a feedback is taken back to the pre-amplification section before microprocessor. The cycle goes on to create a fuzzy logic.



3. Response Mechanism of Proposed Idea



Explanation- Sensor can be categorized into low power and high power sensors. Low power sensors contains photodiodes. Photo sensors which produces a small voltage to the stimulus, whereas the high voltage sensors contains solar cells, which can be used as a sensor of electromagnetic radiations to produce a high voltage that can be used as driving potential directly without amplification.

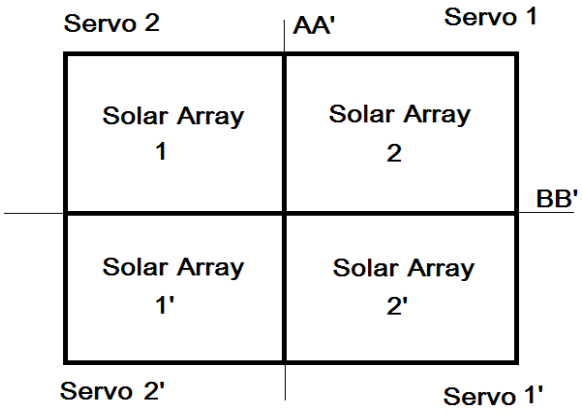
TAKING AN EXAMPLE OF A SUN FOLLOWING VEHICLE

Imagine a small vehicle which can follow the sun in the full day time. Here we can build this vehicle using conventional Artificial Intelligent circuit by simply placing four motors with independent control and place four photo detectors to generate voltage to the stimulus Sun and varying position of the Sun will cause change in voltage strength from photo detectors to detect the intensity of light in the left and right direction of the vehicle. This data can be processed by a processor and further amplified to drive the four motors accordingly, such a circuit can drive two left and two right motors accordingly to drive the vehicle in a direct of constant sun light i.e. to follow the sun.

But even making such a simple car will require computation and processors which will be able to control rotation of four motors to make it to follow sun based on the changing illumination on the four sensors.

Explanation

This model contains four solar cells that acts as high power sensors which produces high voltage to drive servo motors directly without amplification. We can design a simple circuit such that the Array 1, 1' is connected diagonally with Servo motors 1, 1' respectively, and vice-versa. The solar cells are kept slanted at small angle so that they create a difference in value of potential created in two set of array depending upon the exposure of solar cells.



4. Equilibrium Establishment

Let us appoint the TASK of the vehicle stable equilibrium that is created by the junction between the potential created by the two set of array. Suppose light falling on an individual array is greater than that of another one due to the position of the sun being not on the top of the array, due to this positional change of sun intensity on array will create an imbalance in potential created by the different set of array. This will lead to an imbalance in the equilibrium condition. The vehicle is designed in such a way that this imbalance in the potential difference will change the rotation of the motors accordingly and which automatically create a FUZZY LOGIC which tend to restore the equilibrium condition. In simple words the TASK of the vehicle is to follow the sun and corresponding equilibrium condition to the TASK is the condition that the sets of solar array gets equal illumination and produce same voltage that will drive the motors in the left and right side with same speed and will force the vehicle to move in a straight path and deviation from straight line path will be called the unstable condition of the stable equilibrium which will be corrected by our so formed FUZZY LOGIC that will control the revolutions of motors from both the sides to maintain the equilibrium, finally completing the TASK without any complex circuit and computation. This way of solving problems of controlling circuits have a scope in teaching how to think creative without being dependent on computation and programming in circuit designing.

Circuit Designing Using Conventional Low Power Sensors:

Low power sensors includes photodiodes, which only create a millivolt of potential which need to be amplified to make a practical sense of powering motors which generally operates in volts of potential. Taking case of the same sun following car with the help of low power devices we need to amplify the weak signal to a considerable amount using common simple logic amplifiers that uses local harmonic current from a constant power source to amplify the weak signals from low power sensors to convert it into a signal similar to the high power sensor signal. This clever method effectively solves the problem of inflexibility in application of this theory. Now instead of using solar cells we can use small

Photodiodes to induce a small but specifically similar voltage that is variable in the left and right side of sensors with respect to the illumination of sun light on them. Now this small signal can be made to create a difference in potential when amplified in the working potential zone of motors, by using barriers like ZENNER DIOD with a desirable specific threshold potential to limit the potential produced,

This will provide a specific limit to the lower power input signals to produce a considerably low power output voltage which runs the motors of the unstable side and accordingly rotate the vehicle to the TASK represented by an equilibrium state of following the Sun.

Remembering one promise from the start and staying on it faithfully this idea of using simple logic circuit, with a little bit of creativity proved that we need to think from scratch about this potentially useful method of circuit designing, which promises a better understanding and potential application in the fields of AI circuits, autonomous robotics and electronics.

5. Application in the Field of Concentrated Solar Power Plants

Solar power produced using concentrated reflectors meets power demand in many countries, it only requires one time installation cost besides maintenance. But each reflector comes

with a smart circuit that help it follow the sun to focus the light on one spot where the heat exchange takes place for steam generators. This mount for following sun is not that cheap and adds considerably to the economy of the solar plant as number of reflectors are very high. We can apply this idea of high power sensors to create fuzzy logic to follow the sun and make the cost of sun following system cheap that will in fact improve the economy of whole plant by a considerable amount. We only needs to use some solar cells and servo motors for two vertical planes that covers the upper hemisphere above horizon. Without any processors and complex computation, we can create a fuzzy logic that will follow the sun automatically. As number of reflectors are in thousands to concentrate sun light, this slight change in the system of reflector can make installation of concentrated solar plants more economic.

6. Acknowledgment

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