A Soft Computing Control Approach for Future Processbus-Systems

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0. Abstract

This paper discusses approaches of the design of a soft-computing control system to supervise the management of a processbussystem. All existing bussystems like interbus, profibus, canbus, etc. have their own benefits. On one side some bussystems have good diagnostic mechanism but other system have their benefits in timing controls. An optimal processbus control system combines these benefits to one system and it has to do this for its own without any supervising after implementation. Therefore this paper discusses a softcomputing approaches to the design of learning fuzzy systems for processbus control. It is shown, that the incorporation of genetic learning mechanism or neural learning mechanism into a fuzzy logic control system gives fuzzy systems a way of modifying its parameters. The decided approaches to optimize the membership functions and rule base of fuzzy systems for measurement.

1. Introduction

A lot of modern technique devices, like cars, industrial robots or automatic house control uses bussystems. In most cases someone doń t know anything about that while they are doing their jobs correctly. But like as other modern electronic devices there can be several problems. Its easy to see that an open connector can break down the whole system. Also it is possible that an error free network collapsing or become slowly after connect with one more device or subnet. The soft-computing system which is described here is able to learn how to manage the information network, also it will be detect errors to report or to solve them. In some net structure it is also possible to repair it i.e. though disabling the demaged device. Are there any redundant part in the network i.e. a second cable etc. the system will use it in error or jam cases.

Today standard communication networks based on the ISO/OSI sheet model. The soft-computing module is placed on the 7 th sheet. This allows access to network monitoring tools an allows to establish an interface which can run diagnostics and fine tune the network.

These interfaces based on a request/response system. This means that a request will answered by a response. The read request ask a special device for a special data block. If only simple process data is read the system used shared memory or multi port memory. This interface is the only part of the system which is to configure to each bussystem. All modern bussystems have management tool of their own. These management tools are used by the described soft-computing system too. Other tools give the information about hardware diagnostics.

Based on the used bussystem the soft-computing system used his features more in field of diagnostic or system optimizing.

By using ring systems which have better diagnostics than line or star systems, the soft-computing system has to manage the redundancy functions. Such systems can be diagnostic well and their are deterministic, but they can break down by only a single error.

Line or star systems are more flexible and less redundancy is necessary but the possibility for good diagnostic is very low.

Following it will show the function of a soft-computing bus manager for a line system.

2. Realization

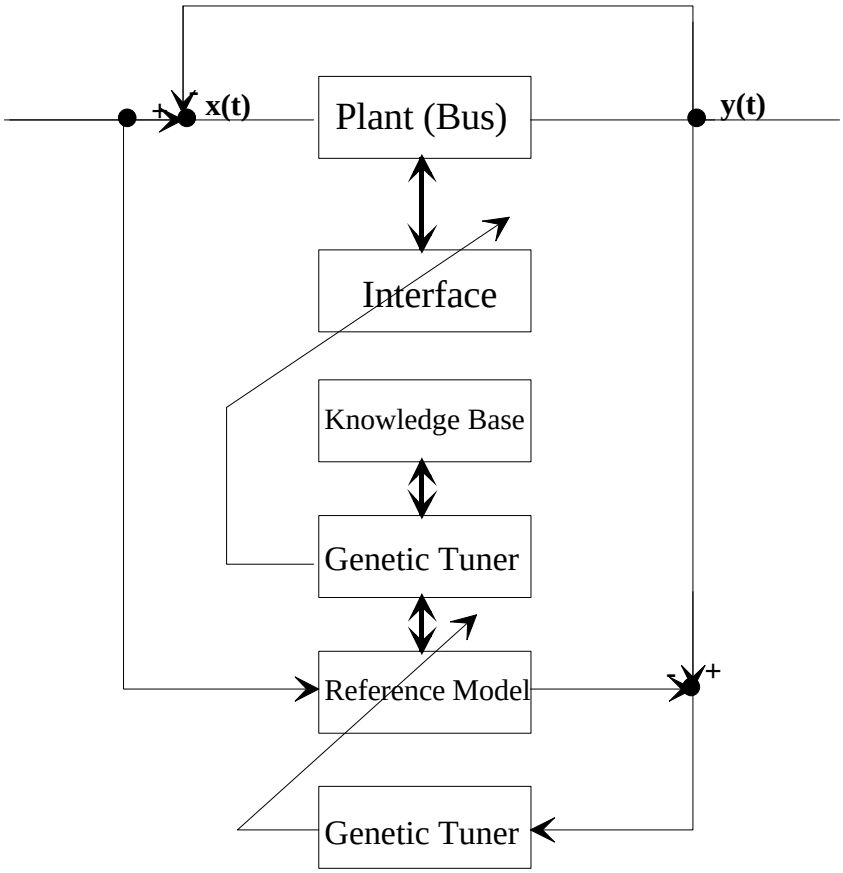
The system which is described here is a line-style bussystems for personal computers. Some personal computers are connected via ethernet. The problem of the ethernet is the using of the CSMA/CA procedure (collision sense medium access / collision avoidance). By using this system the device try to send data if there is something to send. If the communication-cable is in use by an other device it has to wait and send it later or give it a higher priority. This procedure haven't any trouble if there is only a small traffic on the bus. If there is a lot of traffic the system will become very slow. The advantage of the used soft-computing system is to prognostic the timing of the system and the priority of the data. This allow to send an email faster than a large picture.

One more problem is the timing of the bussystem if there will be connected more devices to the bus. Therefore it is necessary to have a flexible bus management. This explain the following example.

The PC A controlled by a powercard the motor A1. Every time the motor started errors will be on the bus. For conventional management systems it is unable to detected this motor, because this error can come from all connected devices. An expert can recognize that the error occurs if the motor A1 started. A soft-computing based system is able to detected such errors.

First of all a reference will forced to learn the timings of the bussystem. This will happen by a neuro fuzzy model which will be trained by a genetic tuner. If the prognostic error of the reference model is small enough, these information combined with information from a knowledge base to a second genetic tuner. This tuner will modify the fuzzy logic management bus interface for better results.

Figure 1 shows the used system.



3. Conclusion

Such system is not implemented jet. This paper would show the way it has to go. At the end there will be an intelligent bus management system which can learn how it has to work on the special bus.

4. References

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