

Use of artificial intelligence for optimal operation of stand alone power production

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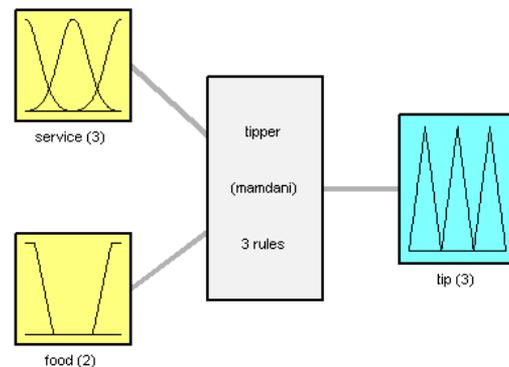
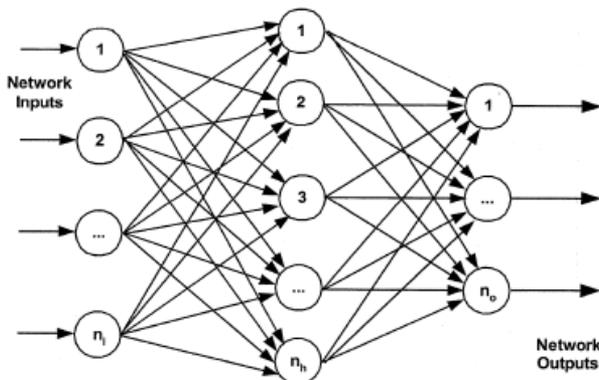
Problem description

Use of artificial intelligence (AI) for optimal operation of a stand alone power system. One part of the optimal operation is to have good predictions of the output power of the renewable sources as well as the load. Secondly the converters in the system must be controlled to keep the power system within stability limits.

What is artificial intelligence ?

AI is computing methods inspired from processes in the nature, especially human reasoning. It can be used for modeling, estimation, prediction and control. The following AI methods are studied:

- Artificial neural networks
- Fuzzy logic
- Genetic algorithms



System tipper: 2 inputs, 1 outputs, 3 rules

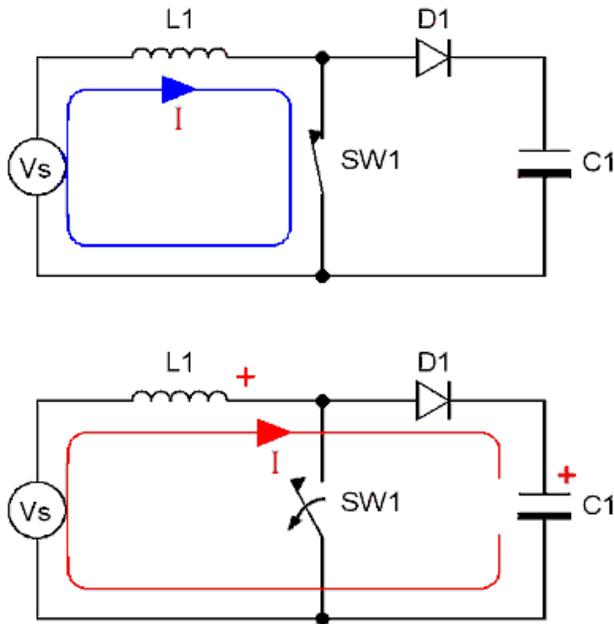
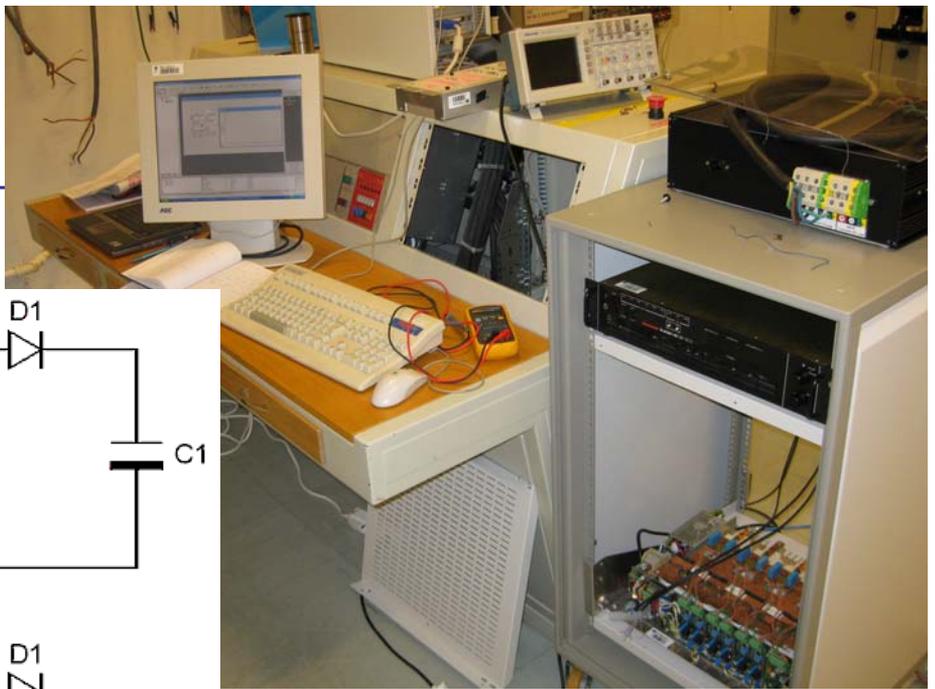
Conclusion

Prediction

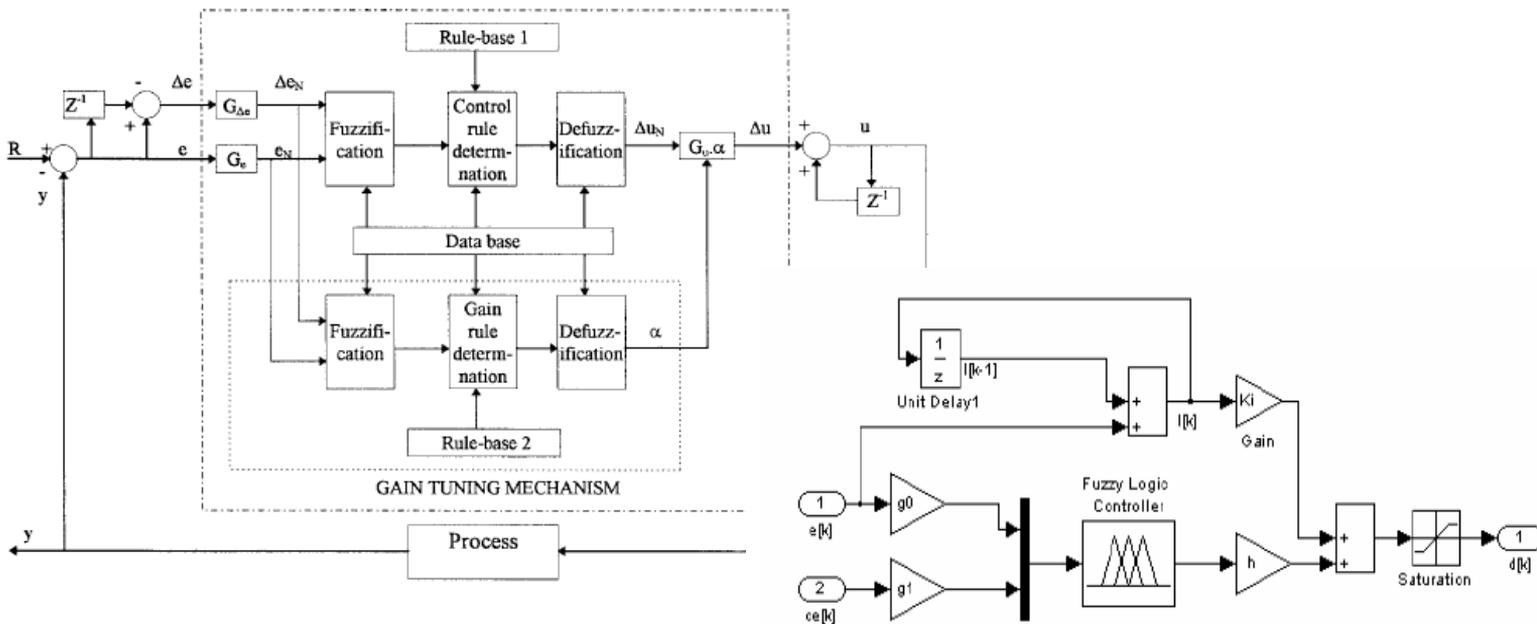
AI is very convenient for short term prediction. The algorithms are fast and do not require a model of the physical system.

Control of power electronics

AI is suitable for control of non linear systems. Fuzzy and neural networks controllers demand a more powerful DSP than a classical PI controller.



Laboratory setup for control of boost converter with varying input voltage. PWM control with dSPACE. Application for PV panels and super capacitors.



Different control strategies are possible: One fuzzy, double fuzzy, fuzzy with integrator in parallel, tuning of PI with fuzzy controller. The two last ones proves to be suitable for power electronics.