

# Energy Fingerprint

*Morten T. Egholm*

DTU Electro, DTU Ballerup Campus, Technical University of Denmark

## INTRODUCTION

If we become aware of our power consumption in our homes, the knowledge will lead to a wiser use of energy, with a lower total consumption as a result.

That statement is the starting point of this project. We will try to develop an easy method to visualize the distribution of the power consumption in our homes on appliance level.

In most domestic homes today, the electricity consumption is only read once a year in conjunction with the annual billing. This does not provide a picture of how the consumption is distributed between the different appliances in the house.

The goal of this project is to make it possible to generate a list of the most consuming appliances in the respective home, only by measuring the total electricity consumption of the household. This list holds the total consumption of e.g. the dishwasher of a given period of time and the number of times the appliance has been operated in that period.

## THEORY

Each electrical appliance has a unique pattern of how the electrical energy is used when operating the appliance. Some machines have several patterns, e.g. a washing machine with quick-, normal- or eco-program, but they are all unique for that type of machine.

Finding these patterns in the total electricity consumption can be difficult, because all these patterns are mixed up when the different appliances are used at the same time.

## METHODS

We have logged the consumption in a nonintrusive way, by counting the impulses, given by the LED on the main meter of a household. In our test case; 1000 impulses pr. kWh.

We have also logged the appliances with the highest consumption of the house, to collect the patterns of as many appliances as possible.

Then we have used a mathematical method that recognizes patterns in a signal, to build the algorithms for finding the patterns from the different appliances in the total consumption.

## CONCLUSION

It was quickly clear that it was possible to find the most unique patterns in the signal of the total consumption, using the individual patterns, that was logged from the different appliances. The challenge is to find the appliances that do not vary so much in the unique patterns, or has a very low consumption.

Our experiments, at this point, indicate that it will be possible to identify more than half of the total consumption this way, if more development is done on the project.

Thereby, it seems like a method that could give the consumer a better view of their electricity consumption, and give them better tools to save energy.