



Software Package for High-Precision Time Measuring Using Microcontrollers

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Purpose

The goal is to find a method for implementation of a concept introduced by the second author for analyzing the chaotic circuits behavior when they serve in measuring parameters as light, voltage and temperature.

Objective

The presented solution is a software package developed for being embedded on a microcontroller and on a personal computer for accurate evaluation of the chaotic circuits operation.

State of the art

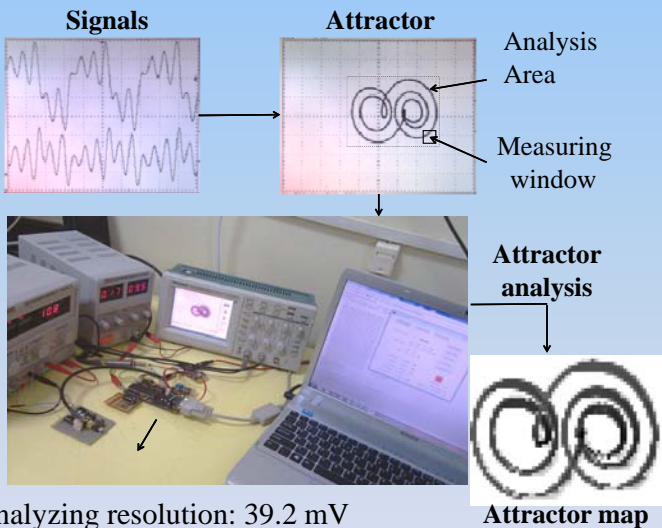
The **attractor analysis concept** based on measuring the time spent in a window is less explored and was introduced by H. N. Teodorescu in 2003.

Concept

The **introduced method** for implementation of the **analysis concept** scans the attractor surface and builds:

- the **average time** in window during a fixed period
- the **number of visits** in the same period

Results



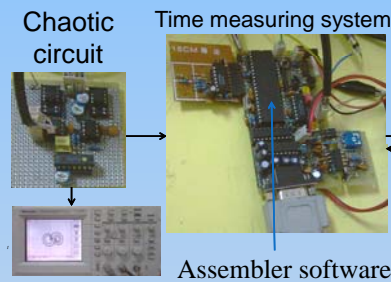
Analyzing resolution: 39.2 mV
Processing time per pixel: 3s

Attractor analyzing method implementation

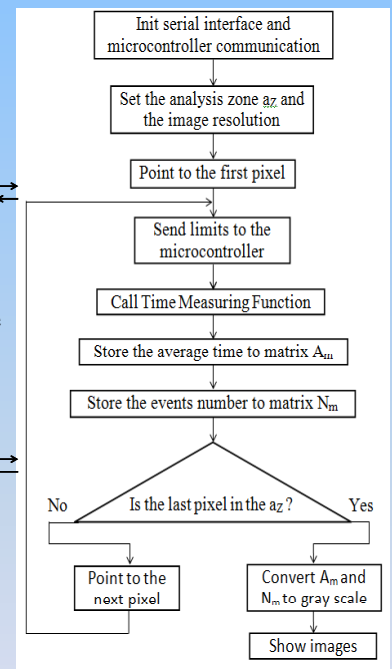
The software package has two components:

- **Microcontroller program** - Time measuring, events counting, setting of the measuring window limits;
- **PC program** – time intervals computation, attractor area scanning, conversion of the average time and events number to gray scale.

Analyzing system structure



PC program interface:



PC program flowchart:

Conclusions

- The maps of the average time and of the number of visits for attractors provide information that is impossible to obtain using other test equipment such as oscilloscopes.
- The analyzing system (software + hardware) allows to decode the measured parameter value with the average time and number of visits.

Advantages

- High analyzing accuracy and reduced mathematical complexity.

Limits: Analysis time increases with the analysis resolution