EMBEDIX: Embedded Computer systems

The Mærsk Mc-Kinney Møller Institute
University of Southern Denmark

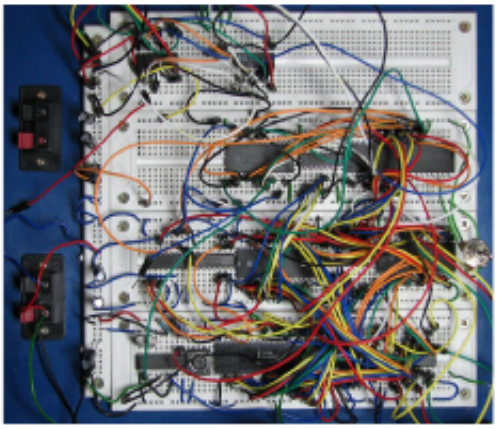
Robotronix: Fall 2016

Lab assignment 1: Build and document a schmit trigger oscillator

Abstract

Most modern electronic systems are based on complex digital state machines, like CPU's communication controllers etc. etc. Common for all these are the need for a clock source to time the transition between states, and keep all operations synchronous.
At the same time, building an oscillator for a digital system is an excellent opportunity to refresh your knowledge about basic digital and analog concepts, and get re-acquainted with prototyping , multimeter and oscilloscope.

DONT PANICK! an oscillator is only 3-10 components



Assignment

Build, experiement and document a schmitt trigger oscillator, abiding by the following:

1. Use only components available at the lab or our electronics workshop
2. The outputs should be suitable for driving a TTL and CMOS clock inputs, like the inputs on e.g. the 74HCT04 and 74HC04
4. The 'product' of the assignment is:
   - A 'data sheet' describing the relevant features and qualities of the oscillator, e.g:
     - Frequency
     - Duty Cycle
     - Output voltage levels
     - Rise and fall times
     - … other relevant information ???
   - A short journal, containing:
     - A diagram, with component values, allowing others to reproduce your circuit.
     - Relevant comments on component and design choices
     - Relevant measurements (what-, why-, how- did you measure)
     - Comments about how the design might be improved if only ...
   - The oscillator design itself can be used further on in the course

Learning responsibility

One of the points of the lab assignments is to figure out what to teach you, and what you already know.
In order for this to work, it is **adamant** that you take note on all aspects you find difficult to understand, and bring it to the attention of the teacher immediately.

Reading

The following is compulsory reading before this lab assignment:

- AN-77 CMOS, The ideal logic family
- AN-118 CMOS oscillators
- AN-140 CMOS Schmitt trigger
- 74HC14 CMOS Inverter
- 74HC14 CMOS Schmitt trigger inverter
- AN-88 CMOS linear applications

Reading data sheets and application notes is not like reading textbooks … it's more like reading a map. You don't need to read and understand all details. After reading, you should remember a few important facts, and be able to quickly look up any information you may need later. Spend no more than 2 hours on reading through the material above … unless you are really fascinated and want to dig deeper.

If you are not used to prototyping, please read:

- Wikipedia/breadboard About Breadboard prototyping
- Wikipedia/perfboard About Perfboard prototyping
- Wikipedia/soldering About soldering

If you are not used to lab instruments like power supplys, multimeters, oscilloscopes etc. You should consider a different course, or be a very quick learner.

Prerequisites

Bachelor degree in computer engineering or similar, meaning:

- Basic, broad, knowledge about electronics
- Knowledge about digital electronics and the basic components involved

Goal of the assignment

To allow you to evaluate your abilities, and learn within:

- Basic electronic concepts related to digital applications
- Basic electronic prototyping
- Basic electronic measurements
- Basic documentation of electronic circuits

Groups:
You will be divided into a number of groups, by the teachers choice. Each group will perform the assignment together, and hand in the documentation in common, as a group.