Sebastian Olsson, seo@kth.se
Jonatan Åkesson, jonatan.akesson@gmail.com

Project specification

Introduction

In our project, we are going to make a study about energy-efficient algorithms. More specifically, we wish to study the field of energy management for personal computers. We find this subject interesting because of many reasons:

- We have a close affiliation to the subject due to us being computer scientists. We experience the various methods utilized by our computers in order to save energy, and we would love to make improvements to the area of research by contributing with our own ideas.
- We are concerned with sustainable development, which we think is a relevant subject today.
- We want to make the user feel that the computer understands his/her needs in a particular situation.
- We want to help the user conserve energy in an adaptive and seamless way.

To better understand the problem and the possibilities with the technologies involved in this project a small pre study was performed before writing this specification. There are usually at least two different ways to control the screen dimming on a linux laptop computer. Since the system used comply to ACPI standard this is the default way. The second option is to control the computer specific hardware directly. To evaluate our possibilities we developed a small script file and was able to dim the screen. An alternative way to switch of the backlight is through DPMS. [2] We also found extensive description of linux power management daemons. [3]

Problem statement

The specific goal of our project is to develop efficient energy management for a Linux computer. This will take form of a software daemon. Our focus will be to conserve power by implementing algorithms for automatic backlight on/off control, screen dimming and sleep mode control. A key feature of our daemon is that it is going to be self-learnable. That is, capable of adjusting itself to the usage of the computer in relation to activity and habits. To pinpoint important areas where power is lost user studies will help us define the problem further.

The functionality will be implemented accordingly:

1. The software daemon will work on a specific computer with a linux based operating system with a graphic hardware of our choice.

2. The software should be able to dim the screen according to our energy saving algorithm.
3. The system should be able to detect at least one user behavior and act accordingly.

Additionally the following features will be implemented beyond the basic functionality:

4. The system should be able to in some way log user behaviour and take the user into account when taking logic decisions.
5. The software should be able to put the computer in sleep mode according to our energy saving algorithm.
6. The system should be compatible with different graphic hardware and linux versions

Approach

An important part of the project is gaining understanding of the way a computer is used by its users. By doing case studies we believe it will be possible to see patterns in the way computers are used. One way of doing the study is to observe a user in real life while the person is using his/her computer. Another way to do this is by installing Camstudio [4] to log user behaviour. The exact method or set of methods we use will be decided later.

In order to make our daemon self-learnable we need to create a learning algorithm that will adopt to the current user and his/her way of interacting with the system. The system will for example strive to keep the backlight low to prevent power drain but it will also adopt to the user preferences in a specific situation. It might also take into consideration if the user historically has been dissatisfied with a setting in a certain situation. To further investigate and detect interesting areas where energy can be saved we will evaluate and study our own behavior when interacting with our computers. Tests will be performed where the newly developed algorithms are compared with a non-modified system to assess power preservation.

To be able to solve the actual problem, however, we will have to develop a software daemon that works alongside the system power management profile. The daemon will control the DPMS [2] settings in real time with the aim to achieve a good compromise between user experience demands and power conservation. To be able to make more intelligent decisions than a traditional setup, logging of user behaviour will be required.

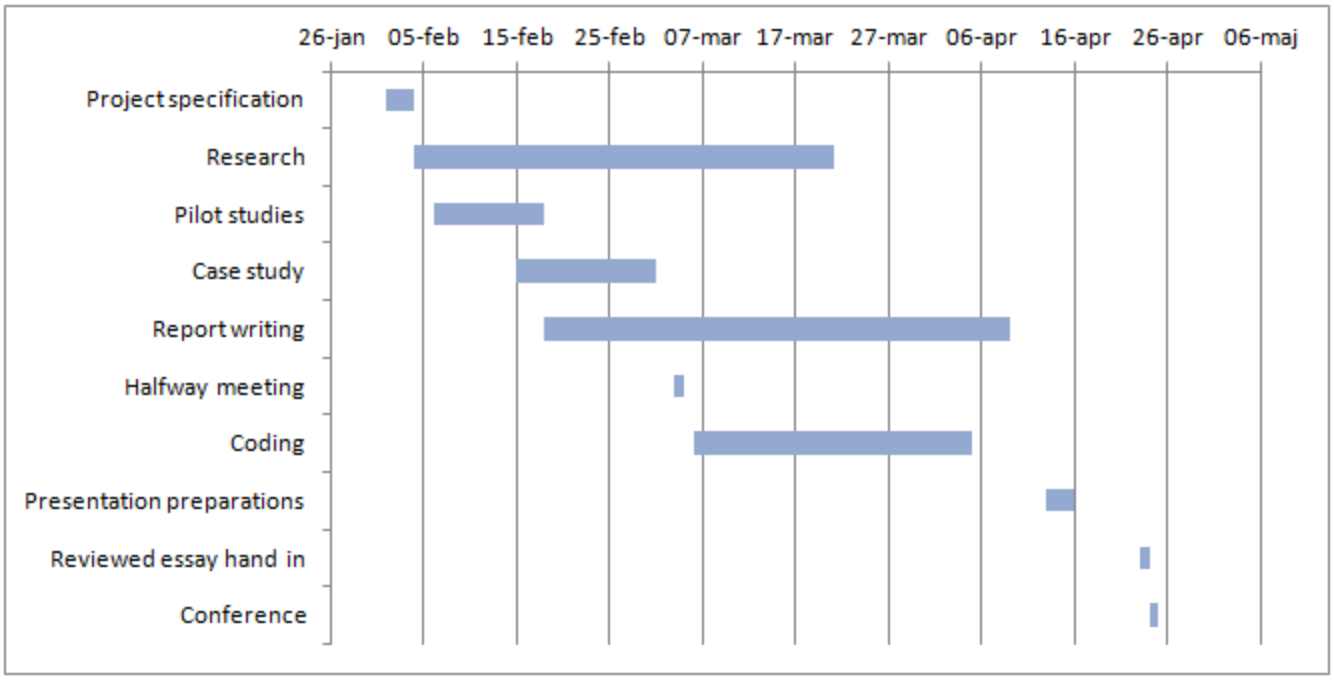
References

1. ACPI (Advanced Configuration and Power Interface), *www.acpi.com*
2. VESA_Display_Power_Management_Signaling,

http://en.wikipedia.org/wiki/VESA_Display_Power_Management_Signaling

3. ACPI Deamons, *http://www.thinkwiki.org/wiki/How_to_make_use_of_Dynamic_Frequency_Scaling*
4. CamStudio - Desktop Screen Recorder, *http://sourceforge.net/projects/camstudio/*

Estimated time plan



Research - Information retrieval and study of documentation and standards. Feasibility and benefit evaluation.

Pilot studies - Feasibility study and evaluation of possibilities and limitations of the software.

Case study - Evaluation of existing energy management problems. Study of user behaviour.