Pedal Powered Computing

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Motivation

The cost, both environmental and economic, of electricity generation is significant. Current initiatives in sustainable power generation make use of tidal, wind and solar power. This work seeks to investigate the possibility of people directly generating their own electricity.

With this work we hope to answer questions as to the feasibility of running computer systems from human-generated electricity and to motivate our development of low power computing infrastructure. We are also interested in developing more efficient and less intrusive energy generation techniques. Our initial investigations focus on the generation of electricity from a bicycle.

Power Requirements

We are attempting to preserve the desktop computer environment but will inevitably require hardware optimised for power consumption rather than performance. Approximate power requirements of some computing components are shown opposite.
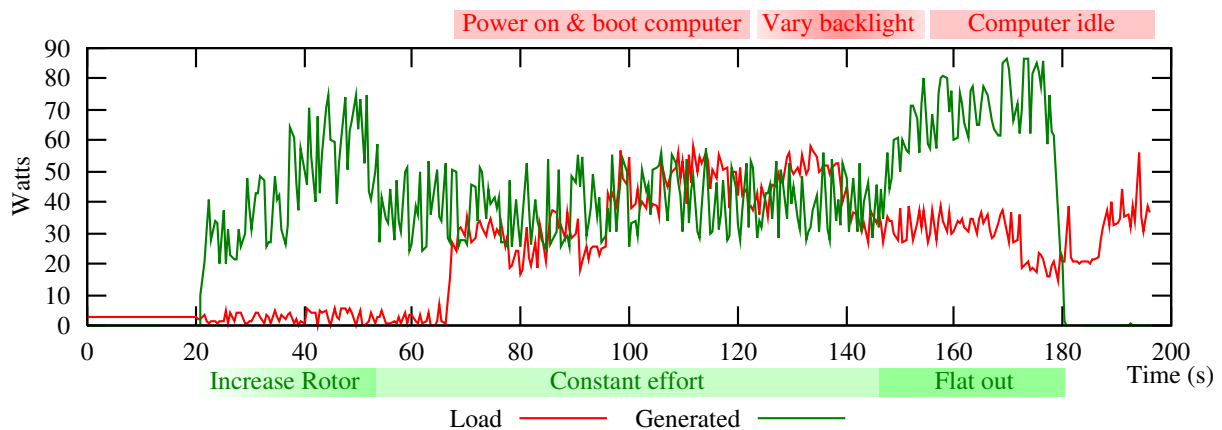
Approximate Power Consumption	
Desktop PC	80–150 watts
Mini-ITX PC	18 watts
Tiny886 PC	9 watts
LCD Monitor	
- Full brightness	34 watts
- Low brightness	17 watts
- No backlight	10 watts

Power Generation

The system makes use of an alternator from a Ford Granada which is spun through contact with the rear tyre of the bike. The operation of the alternator may be controlled by varying the current through the electromagnetic coils in the rotor. A large current generates a strong field (and consequently more power) at the cost of increased pedalling effort. Power generated from the alternator is fed into a 12V lead-acid battery which is used to smooth and buffer the supply to the electronic devices.
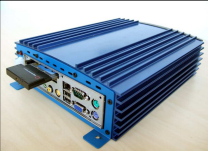
A sustainable rate of power generation is around 30 watts with a peak (sprint) rate of around 100 watts. Sustainable power generation for a desktop PC is not possible even without a monitor attached!

Power on & boot computer · Vary backlight · Computer idle
Increase Rotor · Constant effort · Flat out
Load —— Generated ——

Tiny886 Low Power PC

Integrated Ethernet + Video + USB

Performs like Intel PIII

Mini−ITX PC

Also includes PC−CARD slot

Performs like Intel PIII

Power Meter
- Power generation and consumption
- Rotor current control dial

Automotive Alternator

Variable load/power

Friction contact with tyre