Extended Summary of HWR-854

HAMMLAB in Your Hand: Implementation Strategies and Applications

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Abstract

HWR-854 describes the work carried out by the Halden Project to test and evaluate handheld, mobile devices' applicability for visualising real-time process data.

1. INTRODUCTION

Handheld, mobile computers are now commercially available at reasonable costs and offer users the ability to bring real-time plant data in their pocket. Field operators, managers, maintenance personnel and others now have the option of viewing updated, real-time plant data anywhere within the plant's wireless network zone. Focus in the work has been put on evaluating existing hardware and software technologies to demonstrate today's options.

Visualisation of real-time data on mobile devices requires access to a wireless network. Issues related to establishing such networks within nuclear power plants and security aspects of such networks are not discussed in the report.

Utilising handheld, mobile devices may have several benefits:

- Personnel in the field will have instant access to updated plant data. In particular field operators and maintenance personnel will benefit from this feature as they can themselves check plant status prior to performing an operation, and also immediately see the effects when operating on a piece of equipment.
- Field operations can be carried out safer, as the likelihood of misunderstandings in the communicating between the field operator and the control room is reduced when the field operator can see the data himself.
- Workload on control room personnel can be reduced, as the number of phone calls requesting data values drop.

The work on which this report is based used ProcSee, the Halden Project's own visualisation tool, to demonstrate, test and evaluate the applicability of today's options. However, the strategies and results reported here are generally applicable independent of the visualisation tool used.

The motivation and objectives for the work has been to:

- demonstrate applicability of today's technology
- provide handheld displays as a feature for future HAMMLAB experiments
- demonstrate that ProcSee is a well-functioning tool for research on HSI-design for small handheld devices

2. STRATEGIES

Two different strategies have been identified to visualise ProcSee-based operator interfaces on handheld devices:

1. Run ProcSee itself at the handheld device
2. Run ProcSee at a server and use standard software to view and control the displays at the handheld device

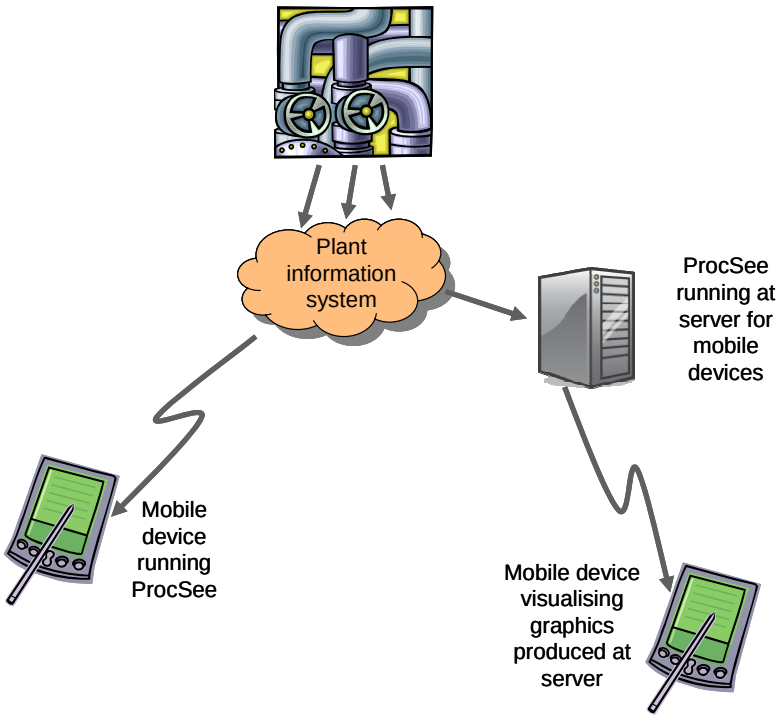

Figure 1: Strategies to visualise operator interfaces on mobile devices
Strategy 1 to the left, strategy 2 to the right

2.1 Strategy 1, Run ProcSee at the handheld device

The first strategy is the most obvious. Find a device capable of running ProcSee as is, launch ProcSee with an appropriate operator interface at the device, and send variable updates at regular intervals over a wireless network using the ProcSee API or the ProcSee OPC plugin. The most critical factors for this strategy are:

- the computing power and graphics capabilities of the device
- the availability of devices capable of running an operating system compliant with the visualisation tool, in our case ProcSee

2.2 Strategy 2, Run ProcSee at a server, view and control it from the device

The second strategy utilises standard software to display screen content from a server at a client, the client in our case being the handheld device. Such techniques have been commonly used for several years to enable computing-intensive applications on thin clients.

Several software technologies exist within this strategy, and we based our testing and evaluation on three common, freely available software packages. Commercial products also exist and may provide additional features, particularly regarding security. The freely available software packages selected for our testing and evaluation were:

- Virtual Network Computing (VNC)
- Remote Desktop
- X-Windows

3. DEVICES

Three different devices were used during the testing:

- *Asus R2H Ultra Mobile PC*. This was the only device capable of testing strategy 1. It was also used to test all three software packages for strategy 2.
- *Nokia 770 Internet Tablet*. This device was used to test all three software packages for strategy 2.
- *Hewlett Packard iPAQ 4700*. This device was used to test VNC and Remote Desktop for strategy 2.

The Nokia 770 and the HP iPAQ are comparable in size and weight, the Asus R2H is considerably larger and heavier.

Figure 2: The devices. From left to right: Asus R2H, Nokia 770, HP iPAQ 4700

TEST CASES

Two test cases was used, one from HAMMLAB and one from the Halden Reactor monitoring system. In both cases, a small set of displays was selected in co-operation with process experts. The selection was based on a judgement of what information would be relevant for a field operator. To simply downscale the displays to fit the screen of the handheld devices would make the displays unreadable for the operator. Instead, the displays were re-designed and optionally split into several displays to fit the limited space available on the devices' screens.

The field operator's interaction with the displays at the handheld devices included the following options:

- Navigate from one display [illegible]nter to press navigation buttons within the displays
- Select specific objects using
- Pan displays horizontally a [illegible]r to access scrollbars

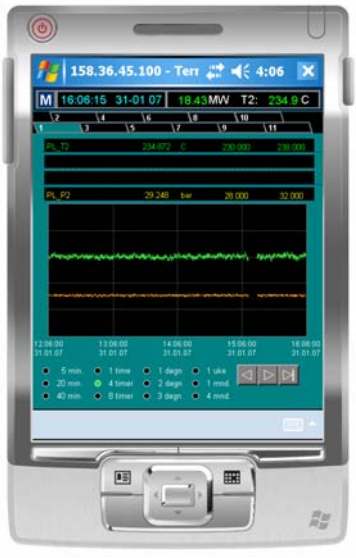

Figure 3: Hist [illegible]ndheld device

4. RESULTS

The tests demonstrate that very good results can be obtained using both strategies. Visual presentation is generally fast and flicker-free. Except for one combination of device and software, the number of colours available is more than sufficient. Navigation from one display to another is generally fast; and even panning and scrolling within a display can be carried out without significant delays for most combinations of devices and software.

The best performance and easiest usage among the devices in the test are obtained using strategy 1 and the Asus R2H. However, this device is considered too large and too heavy to be carried around by personnel in the field. The performance and ease-of-use ratings for strategy 2 are also very good, making the Nokia 770 with Microsoft's Remote Desktop client our favourite. Its visual presentation and performance is very good and its small metal case keeps the device well protected in the pocket while not in use.