

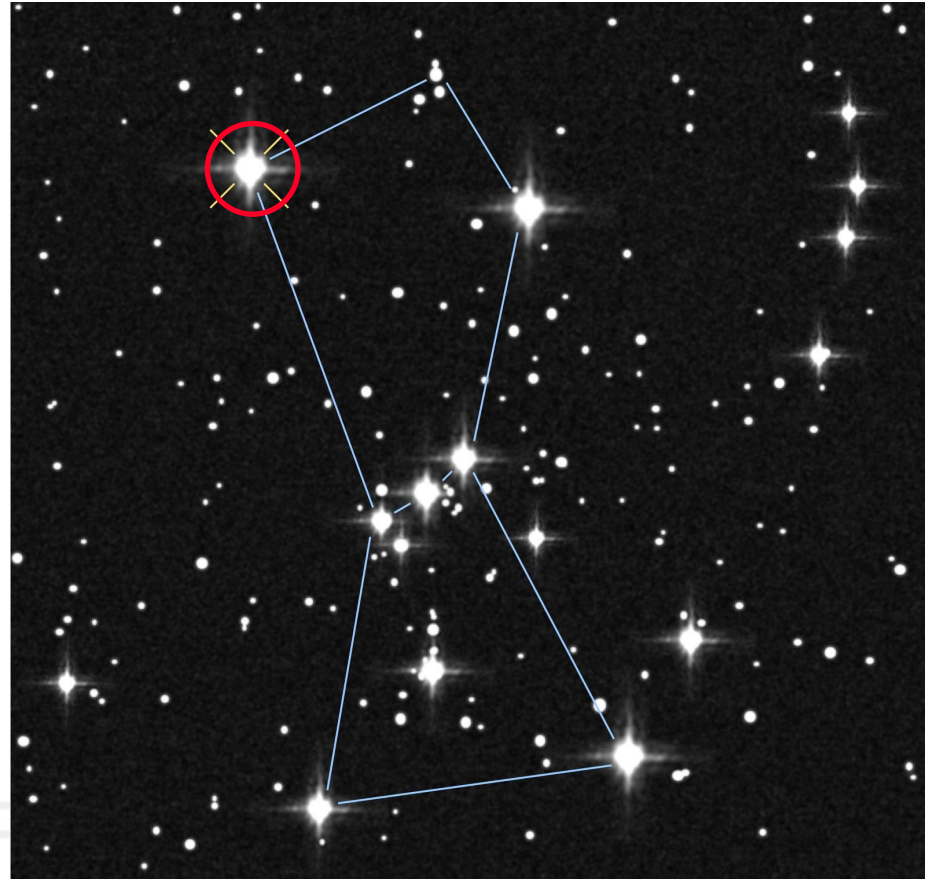
BeTelGeuse: Tool for Bluetooth Data Gathering

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Outline

- Related data gathering tools
- BeTelGeuse
- Sensors and usage scenarios
- Demonstration
- Conclusions



Data Gathering

- Many context-aware applications rely on information about human activity
 - Activity often needs to be inferred from physiological sensor data
- Different tools for gathering data have been developed
 - Custom sensor boards: Intel Research Seattle (2006), Waseda University (2005)
 - Mobile tools, e.g., ContextPhone (HIIT, 2005), Personal Mobile Hub (IBM Research, 2004)
- There is a lack of tools that
 - Don't require special hardware and are free to use
 - Extendable to new sensors, devices and platforms

BeTelGeuse



BeTelGeuse

- BeTelGeuse turns a standard mobile device into a relay node
- Collected data is forwarded to a remote server



Advantages of BeTelGeuse

- Extendable to new types of Bluetooth sensors
- Support different platforms
 - PC
 - Mobile phones
 - Hand held devices
- Simplify gathering of contextual data
- Available under the LGPL license
 - www.cs.helsinki.fi/group/acs/betelgeuse

Features

- Separate core that offers minimal functionalities needed to run the tool and defines interfaces for extended functionalities
 - Custom extensions for different platforms
- It is possible to add support for new sensor types by adding a new parser to the tool
- Local device can be used as a data source
 - Bluetooth proximity, cell id, etc

BeTelGeuse Requirements

- Programmed in Java
- The core is Java 1.3, MIDP 2.0 / CLDC 1.1, and Personal Profile compatible
- Java Bluetooth stack is required
- BeTelGeuse has been tested with Windows XP, Linux, Nokia 6680, N80, N91, Sony Ericsson W800i and Hewlett-Packard hx4700 PDA

BeTelGeuse	
JSR-82	Java 1.3, MIDP 2.0 or Personal Profile
Bluetooth stack and operating system	

Phone Version of BeTelGeuse

- Allows mobile gathering of data
- The PC and PDA version contain the same functionalities as the mobile phone version
- We use a lightweight transfer protocol to send data to a server over an internet connection



The screenshot shows a mobile application window titled "BeTelGeuse". At the top, there is a status bar with signal strength and battery icons. Below the title bar, there are three buttons: "Temperat", "GPS", and "LDR". The "GPS" button is highlighted with a red border. To the right of these buttons is a large black arrow pointing left. Below the buttons, the following data is displayed:

Latitude:	51D 18'0040" N
Longitude:	009D 28'0052" E
Altitude:	50.2m
GMT:	13:54.29
Satellites:	6
PDOP:	

Phone Version of BeTelGeuse

- Battery life depends on
 - Number of sensors
 - Amount of data communicated
- Signal strength also affects the battery life
- Nokia 6680's battery lasts for 3-4 hours



Using Sensors with BeTelGeuse

- Authenticate and pair the sensor
 - Some sensors require authentication and pairing with the local device
 - Authentication is platform and stack dependent
- Select a parser for the sensor
 - The Bluetooth address or the friendly-name can be used to map the sensor to a parser
- Two modes of operation
 - Periodical inquiry for new devices
 - Device inquiries triggered by the user

Plug-ins

- BeTelGeuse is not designed to analyse the data, it simply collects it
- Plug-ins can be used for custom extensions
 - We use a transmitter plug-in to send collected data to a remote server
 - Activity recognition
 - Experience sampling

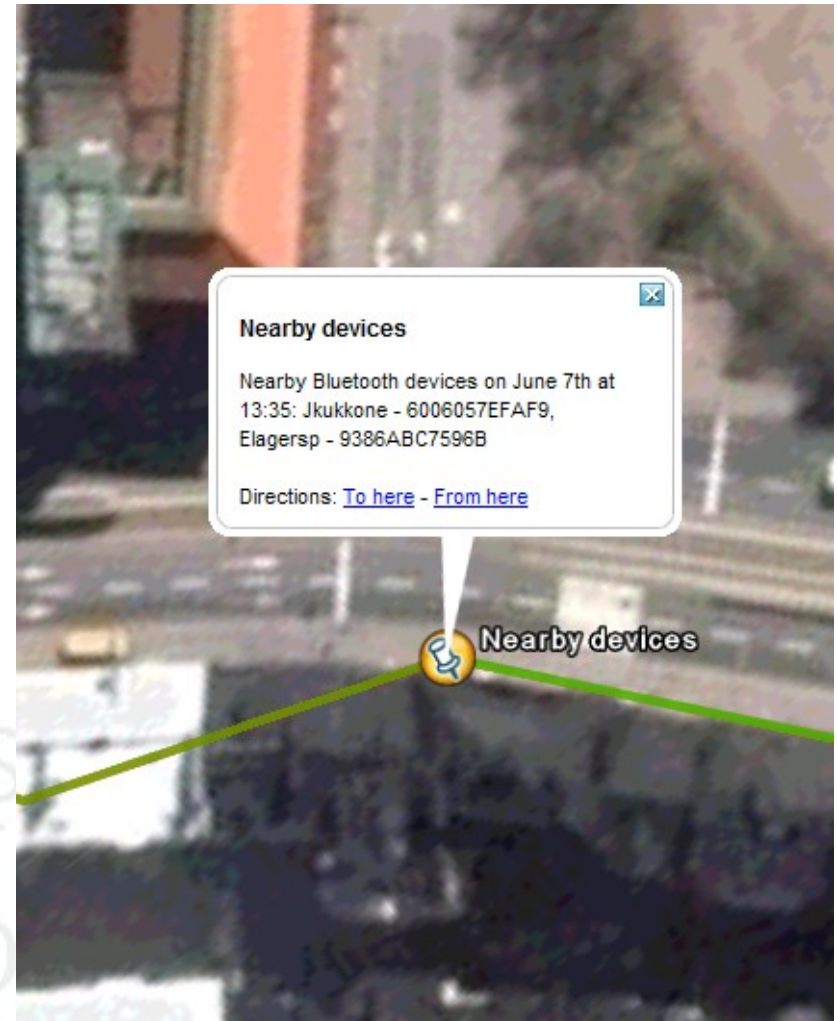


Usage Scenarios

- Activity recognition
- Behavioural analysis
- Context-dependent user modelling
- Background application for experience sampling studies
- GSM positioning
- Location clustering
- Context data source for external applications



BeTelGeuse and Google Earth



BeTelGeuse and Google Earth



TECHNOLOGY

PC Version of BeTelGeuse

Bluetooth data gathering tool - (c) Helsinki Institute for Information Technology HIIT, 2005

File Options

LDR Temperature GPS

BTDevices 006057EFAF9C Jkukkone
0002C7295A56 BlueGPS 295A56

Reader

Read frequency (ms) 100

Reconnect timeout (ms) 4000

Max reconnect timeout (ms) 128000

Stop trying after max timeout is reached ☐

Update

GPS

Latitude 51D 18'0040" N

Longitude 009D 28' 0052" E

Altitude 50.2m

GMT 13:54.29

Satellites 6

PDOP 50.0

HDOP 50.0

VDOP 50.0

Protocols GGA, GSA, RMC, GSV

Temperature 21°C

PC Version of BeTelGeuse

Found Devices

Bluetooth Address	Friendly Name	Connected
006057EFAF9C	Jkukkone	No
0002C7295A56	BlueGPS 295A56	No
001167034683	LDR	Yes
001167034683	Temperature	Yes
001167034683	GPS	Yes

Device Inquiry interval (ms):

20000

Save

Create a mapper rule
for selected devices:

Parser type:

Accelerometer

Create rule

INFORMATION
TECHNOLOGY

PC Version of BeTelGeuse

Device Mappings

Device mappings currently active:

Parser type	Name or Address
GPS device	0002c7295a56

Add

Delete

Please give a friendly name or BT address and parser type:

☒ Friendly name:

☐ BT address:


Parser type: Accelerometer ▼

PC Version of BeTelGeuse

Bluetooth data gathering tool - (c) Helsinki Institute for Information Technology HIIT, 2005

File Options

LDR Temperature GPS **GPS**

Latitude	60D 12' 2494"N	Reader	GPS
Longitude	024D 57' 6780"E	Read frequency (ms)	<input type="text" value="100"/>
Altitude	75.5m	Reconnect timeout (ms)	<input type="text" value="4000"/>
GMT	14:42.13	Max reconnect timeout (ms)	<input type="text" value="128000"/>
Satellites	3	Stop trying after max timeout is reached	<input type="checkbox"/>
PDOP	50.0	<input type="button" value="Update"/>	
HDOP	50.0		
VDOP	50.0		
Protocols	GGA, GSA, RMC, GSV		

Conclusions

- BeTelGeuse is a generic data gathering tool
 - Extendable to new types of Bluetooth sensors
 - Support different platforms
- Multiple usage scenarios
- Available under LGPL
 - www.cs.helsinki.fi/group/acs/betelgeuse



Thank you!

Questions?

