This presentation comprises the slides shown by Georg Ströhlein in his talk on the MLEARN 2004 conference in the Castello Odescalchi di Bracciano on July 5th 2004 as well as some remarks added afterwards in order to explain the slides. These annotations (typed in blue) differ from the spoken words.
HistoBrick: mobile edutainment into descriptive statistics

Georg Ströhlein

FernUniversität in Hagen (FeU)

Electrical and Information Engineering

georg.stroehlein@fernuni-hagen.de
Contents

➢ Framework

➢ What is meant by the term “mobile learning”?

➢ Summary of preceding work done at FeU

➢ Objectives of current work in general

➢ Design of J2ME MIDlet ‘HistoBrick’

➢ Future prospects
HistoBrick is part of the German contribution to the EU Leonardo da Vinci project “m-learning: the next generation of learning”.

German partner: Chair of Data Processing Technology (DVT in German), headed by Prof. Dr.-Ing. Bernd Krämer, of the FernUniversität in Hagen.

Other partners: ERICSSON (LMI, leader), Distance Educ. Int., BUESP
All partners of a preceding activity agreed that ‘mobile learning’ means the provision of training courses via handheld (!) wireless devices:

– PDAs (Personal Digital Assistants),
– smartphones and
– mobile phones

This ‘definition’ explicitly excludes notebooks.
Previous work on mobile learning

- Development of a WML-formatted course on descriptive statistics designed for WAP phones, including features like self-tests and student support services (e.g. email to tutor via server side scripting using PHP)
- Transformation of this course into HTML and eBook formats for on/off-line use with PDAs
- Evaluation of these courses and their features, see e.g.: http://www.fernuni-hagen.de/ZIFF/ZP_120.pdf; the next two figures are taken from that report
20% of trial students recommended phones

S10: I'd recommend it for others

- **PDA**: 20% strongly agree + agree, 60% uncertain, 20% disagree + strongly disagree
- **R380s**: 20% strongly agree + agree, 60% uncertain, 20% disagree + strongly disagree

**percentage of answer class**
- ■ strongly agree + agree
- □ uncertain
- ☐ disagree + strongly disagree
Costs for GSM data transfer are a ‘penalty’

S20: costs for downloading course were acceptable

- PDA
- R380s

percentage of answer class

- strongly agree + agree
- uncertain
- disagree + strongly disagree
Conclusions drawn from previous work

- Students do not like to read long texts from small screens.
- Students appreciate the personalisation features of eBooks such as adding remarks, sketches etc.
- Students think the costs of mobile access to comprehensive course material is much too expensive as compared to a dsl-flatrate, e.g.
- Therefore, in the framework of this new project the content offered to students is based only on the strong points of current mobile phones.
Project objectives in general

- to improve the quality of, and access to, continuing vocational training, in particular for the ‘always on’ generation
- to increase access to and enjoyment of education and training
- to harness current and new technologies when developing and trialing courses designed for mobile handsets
Why serve mobile students?

Why design a mobile learning application?

FACTS

! The majority of students of FernUniversität are studying part-time, are working, and have a family. Thus, they experience a huge workload and tight daily routine.

! A survey¹ in ’97 revealed that:
Approximately 75% of the students who were taken off the university register or did not re-register said they could not manage to find their time for work, family and study any more.

In the daily lives of very busy students or other participants of further higher education, the only time span that seems to be mainly unexploited for e-learning is the time spent during public transportation.

The design of an appropriate mobile e-learning scenario has to take into account the usually distracting environment, possibly bumpy conditions as well as unreliable network access.
Mobile edutainment into descriptive statistics?

HistoBrick, what is it for?

IDEAS

- Enable students to learn about descriptive statistics with an almost always and everywhere accessible tool
- Try to completely attract a mobile student’s attention in usually distracting environments by ‘artificial tension’

REALISATION

- A MIDlet which can be downloaded ‘over the air’ (OTA) onto Java-enabled mobile devices
- Designed mainly for single player off-line learning, but sophisticated built-in communication features, too
Demands on mobile application

! Designed mainly for off-line usage in order to minimise the costs
! Designed for single-hand operation in order to minimise the influence of bumpy conditions during transportation, for example; this means using (smart)phones instead of PDAs
! Using only SUN’s J2ME classes instead of C in order to limit developmental efforts to a reasonable amount
! Provide all student support services (SSS) that can be conveniently used
What is J2ME?
What is CLDC?

J2ME Connected Limited Device Configuration (CLDC)

- Data types, e.g. “real” or “integer”
- Core JLS & JVMS features
- Core java.* libraries
- Additional I/O and networking libs
- Security features
- Internationalization
What is MIDP?

J2ME Mobile Information Device Profile (MIDP)

- Application model (life-cycle, packaging)
- Persistent storage (RMS APIs)
- Networking (HTTP, etc.)
- User interface (High and low level APIs)
Combinations found on real devices?

Configuration version:
- CLDC 1.0
  Standard configuration for MIDP 1.0 and MIDP 2.0.
- CLDC 1.1
  Enhanced configuration for MIDP 2.0. Requires CLDC 1.1 capable emulator.

MIDP version:
- MIDP 1.0
  Basic support for MIDP. Will run on all devices that support MIDP 1.0 or higher.
- MIDP 2.0
  Includes additional enhancements. Will only install on devices that support MIDP 2.0 or higher.

© SUN ™ ONE Studio 5 ME
Recommendations on J2ME features

- MIDP 2.0 for support of secure connections (HTTPS) as well as advanced gaming features
- CLDC 1.1 for support of “real numbers” in order to allow for scientific calculations (e.g. SDEV)
- But: in June ’04 no phone is found in the stores fulfilling these requirements and affordable for a typical student
- Thus: re-design for CLDC 1.0 and display of 1st, 2nd and 3rd quartile (integers) instead of standard deviation and mean (both reals)
JAD-File controls deployment

© SUN ™ ONE Studio 5 ME
Mobile access of content via GPRS
Mobile application consists of two files:

* JAR = Java archive, contains program and other files like graphics, texts etc.
* JAD = Java application descriptor: is used by mobile device to identify suitability and to provide additional information

Both HistoBrick files together have approximately 20 kBytes, which typically take 8 seconds for download via GPRS; seems acceptable
Why descriptive statistics?

I found these inscriptions on the day of my arrival in Rome beneath the roof of the Istituto Nazionale di Statistica, which happened to be located just across the street of my hotel. By Tacitus??

transl.: numbers are the node of everybody’s affairs

Numbers are the basis of public affairs
Brief description of J2ME MIDlet I

Game screen on Sagem MyX-7 phone (CLDC 1.0 / MIDP 2.0)

- Number of current/all bricks
- ‘Falling brick’
- Boxes to move bricks into
- Quartile plot of actual distribution
- Target quartile plot
- ‘Mini-joystick’ to move the ‘bricks’; ‘up’: 2sec pause for thought
- Menu soft keys; right one for ‘back’ here
- Selection soft keys
The HistoBrick MIDlet shows an introductory ‘splash’ screen and then a page on which the desired language can be selected. After that, the main menu appears.

From the main menu, all important features can be accessed. The ‘new’, ‘load’ and ‘set game’ entry start a game with different preconditions: ‘new’ means randomly chosen initial values, ‘load’ continues a previously saved game, and ‘set’ allows for manually chosen initial values.
During a game, a small square, i.e. the ‘brick’, is automatically placed on top of the screen, and approximately three times a second it is moved downwards.

The gaming student’s task is to move the ‘bricks’ into the boxes shown below by pressing the appropriate buttons in such a manner that finally the characteristic numbers of the distribution created agrees as closely as possible with the target values.
The indicators of the characteristic numbers of the actual distribution of ‘bricks’ and that of the target values are shown below the boxes.

The main learning objective is to let students develop a sound knowledge of the relation between the shape of a distribution and the so-called measures of location and spread.

It is the task of the tutor to let students experience all the ‘dirty’ effects encountered in everyday statistics.
The details of the method by which the tutor sends game conditions to a student’s phone are still subject of research. The method has to be cheap for the tutor’s institution and the students as well; and it has to be independent of device specific features.

At the moment, email-to-SMS services combined with the J2ME messaging features as well as connecting to a special web page are considered.
HistoBrick: screen design

J2ME IDE Emu

main menu (IDE)

game screen
Results obtained so far

Results (obtained with 7 test students)

- Students’ attention is captured
  (after approx. 1 minute of gaming, students forget about their environment)

- Only male students preferred “HistoShoot”
  (male students like a space ship firing on a solid wall to have unwanted bricks explode)

- Usability issues detected; IDE Emu -> Phone ??
  (students have to know which phone button to press for all different selection activities)
Future prospects of HistoBrick MIDlet

Technical aspects

! Embed HistoBrick into an mLMS

! Utilise HTTP(S) connections for as many channels of information exchange as possible:
GPRS – flatrate (SMS-gateway etc.)

Didactical aspects

! Establish convenient student-to-student and tutor-to-student (two-way) communication

? Bricks of different weight; demo mode to create model distributions; randomly chosen x-position
References I

Project websites:

Project papers etc. (current project)
Ströhlein, Georg: HistoBrick – harnessing J2ME for mobile VET into descriptive statistics; accepted for publication as short paper for: MLEARN2004 conference in Bracciano, 5-6 July 04
Ströhlein, Georg: HistoBrick – mobile edutainment into descriptive statistics; accepted for publication as short paper in: i-com Themenheft e-learning; to be published in August 04

Project papers etc. (preceding project)

Game-based learning, mobile devices
References II

Java
Hommes, O.: Class MathFP.
SUN: JSR-000030 J2ME Connected, Limited Device Configuration [CLDC 1.0, note added by author],
SUN: Mobile Information Device Profile (JSR-37) [MIDP 1.0, note added by author],
SUN: JSR-000118 Mobile Information Device Profile 2.0 [MIDP 2.0, note added by author],
SUN: JSR-000139 Connected Limited Device Configuration [CLDC 1.1, note added by author],
SUN: Using Fixed Point Arithmetic in the Connected Limited Device Configuration,
SUN: Floating Point Numbers in MIDP,

Other topics
Pottel, H.: Statistical flaws in Excel, e.g. from