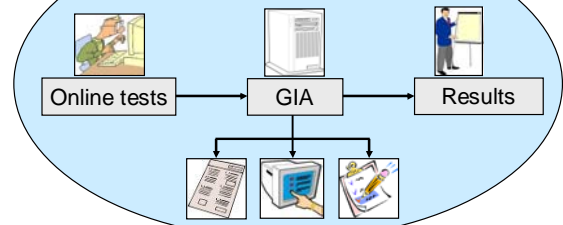


Graphical Interactive eAssessment in Surveying

Hartmut Müller
i3mainz

FIG, April 2005

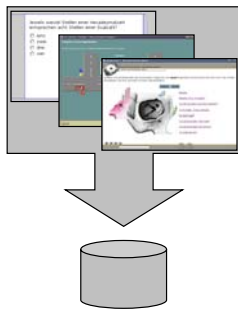
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Online Tests and Exams



Online Tests and Exams

- Different types of questions
- Used for e.g.
 - Online polls
 - Tests in e-learning courses
 - Exams in universities
- Advantages of Online Tests
 - Fast deployment
 - Automatic data entry
 - Fast analysis
 - Reusability of questions

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Online Tests and Exams

Current Solutions

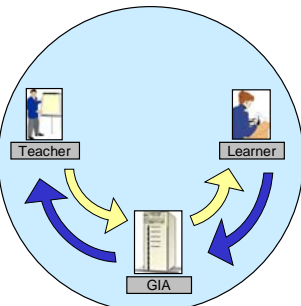
- Single-/Multiple-Choice questions
- Good quality of learning materials
- In the past years: more graphics based questions
 - Hot-Spot,
 - Drag & Drop, ...
- Plug-In needed (Shockwave, Flash)
- Questionnaires have a fixed structure
- Authoring is time- and cost-intensive



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GIA (Graphical Interactive Assessment)



Goals for GIA

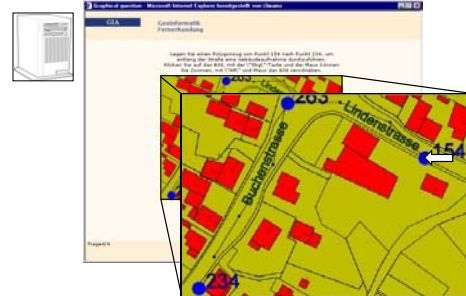
Development of a tool with the following characteristics

- **Graphics based tests**
- Short authoring times
- Automatic evaluation process
- Modular architecture
- Extensibility of the system

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GIA: Example of a graphical question



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i3 mainz GIA: Templates

GIA: Extensibility by the use of templates

- Templates developed through:
 - Analyzation
 - Generalization
 - Separation into components

Fundament of the development of questions within GIA

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i3 mainz GIA: Technical specifications

- **PHP and HTML**
In use for authoring, providing, evaluation and administration of the system.
 - Authoring
 - Appearance
 - Evaluation
- **Javascript**
Manipulation of the image (DOM) and verification of the user input.
 - Action
- **SVG (Scalable Vector Graphics)**
Graphical components within the questions.
 - Graphics

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i3 mainz GIA authoring

(1) GIA-module for building tests and questions

- Developed question templates
 - „buffer“ (draw a polygon)
 - „image“ (filtering a raster image)
 - „graph“ (mathematical graph)
 - ...
- Internet based building of questions
- Personified exams or tests
- Support for building questionnaires

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i3 mainz GIA: authoring of an „Area“-question

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i3 mainz GIA : authoring of an „image“-question

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i3 mainz GIA authoring: adding the Metadata



Use of Metadata within GIA

- Structuring of the questions for better locating and therefore an easier reusability
- In GIA: Segmentation in chapter and subchapter

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i3 mainz GIA - Presentation module

(2) Presentation module

Shows the graphical part of the question without the correct answers given by the author.

Requirements:

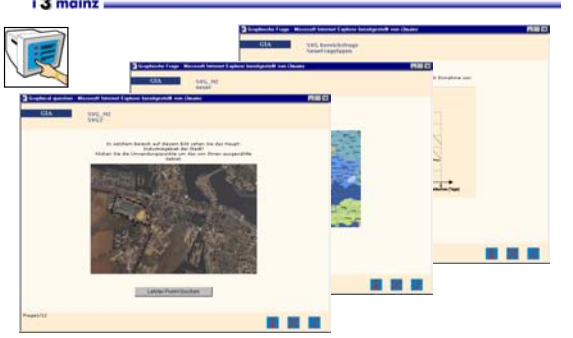
- Plug-In free
- Full Graphical support
 - Raster
 - Vector
- Standardised technology
 - XML based
 - Web-based access

Approach

- Scalable Vector Graphics (SVG)
 - To be 2D Vector standard (W3C Recommendation Jan 14th, 2003)
 - Functionality of SVG
 - Text-based description
 - Vector graphics (inclusion of raster graphics possible)
 - Seamless Zooming
 - Online-Painting possible

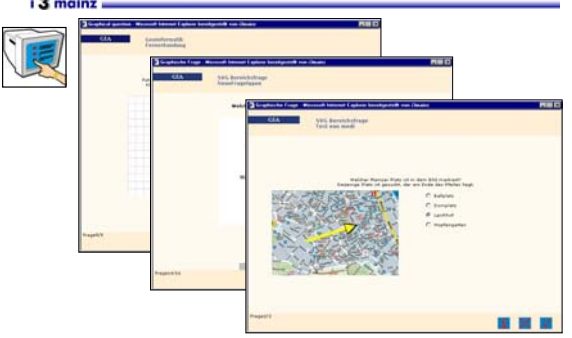
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i3 mainz GIA

(3) Evaluation module

- Shows the default and the given answers to the author.
- Allows to change the proposed points and marks.
- Alternatively; automatic evaluation

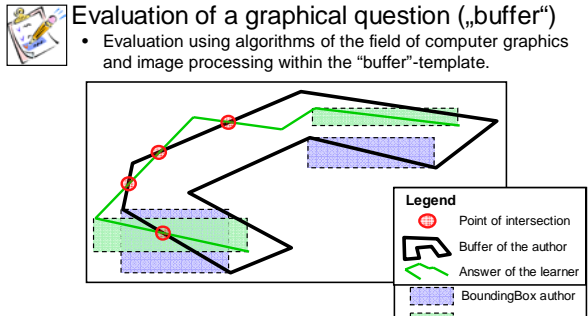
FrageID	Frageinhalt	Kategorie	Erwartete Antwort	Frage-Punkte	Punkte/Bild
8991	Welches Land hat die höchste Bevölkerungsdichte?	Geographie	China	1	1
8992	Welches Land hat die niedrigste Bevölkerungsdichte?	Geographie	China	1	1
8993	Welches Land hat die höchste Gebirgsbildung?	Geographie	China	1	1
8994	Welches Land hat die höchste Meereshöhe?	Geographie	China	1	1

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i3 mainz GIA: Evaluation module

Evaluation of a graphical question („buffer“)

- Evaluation using algorithms of the field of computer graphics and image processing within the „buffer“-template.



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i3 mainz GIA: Evaluation module

Korrektur von Student 503050

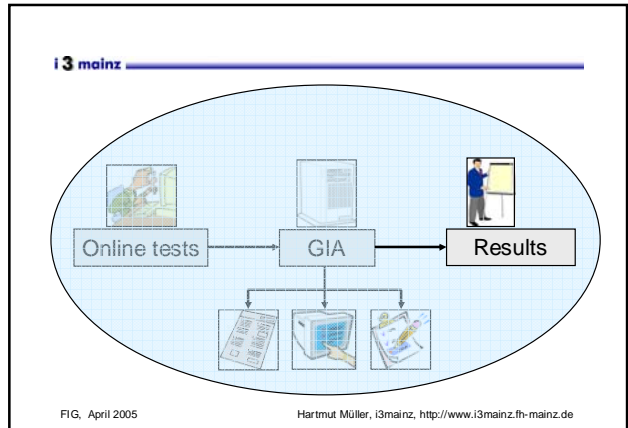
Richtig: [grid] Student: [grid]

Graphical question - Microsoft Internet Explorer bereitgestellt von i3mainz

Engelstein 503050

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i3 mainz GIA

Results

- Running Plattform
 - Short authoring times
 - Automatic verification process
 - Storage of the user profiles
- System Applikation in two areas
 - UAS Mainz (used for research and in the geomatics-lecturing)
 - Health&Media (used for Certified Education in Medicine)
- Enduser Evaluation
 - Author
 - Learner

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i3 mainz GIA

User tests in Mainz

- Tests with altogether 52 students of „Geomatics and Surveying“ with the goals:
 - Test of the functionality of the prototype
 - Usability of the question templates
 - General acceptance
- Tests with several authors (among others professors and staff from the institute) with the following goals:
 - Usability of the prototype
 - Comparison of the time needed to build a questionnaire

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i3 mainz GIA: User Tests with students

	Yes	No	Maybe
GIA as assessment?	76 %	2 %	22 %
GIA for examinations?	30 %	34 %	36 %
Graph. questions better?	89 %	0 %	11 %

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i3 mainz GIA

Summary

- Online assessment has a vast field of usages
- Graphical Questions provide a large potential
- GIA solution offers support for authors by means of specified templates
- Success of the chosen approach is shown in currently two application areas

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