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Evaluation of a Positioning Method Using IrDA Sensors and a Pedometer

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Today's Topics

1. Wearable Augmented Reality System (WARS) Using IrDA Markers and a Pedometer
2. Experiment for Evaluating the Proposed Positioning Method
3. Intuitive Presentation of Annotations for WARS Using 3D Models

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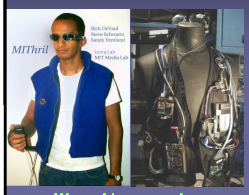
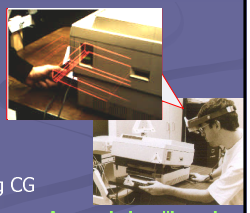
Background – Wearable Computers Augmented Reality (AR)



Wearable computer "MIThril" (MIT)

- **Wearable Computers** are computers which can be equipped by the user.



- **Augmented Reality (AR)** is techniques which can overlaying CG on the real scene image.

Augmented reality system "KARMA" (Feiner et al. 1991)

Wearable Augmented Reality System "ARISE"

- The system shows **annotation overlay images** to the user using augmented reality.
- The system can be used in **wide area of indoor** environments.

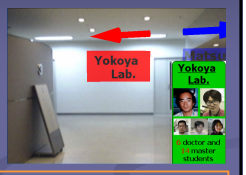
Examples of annotation overlay images

Overview of ARISE

Approach

Required information to realize wearable AR systems

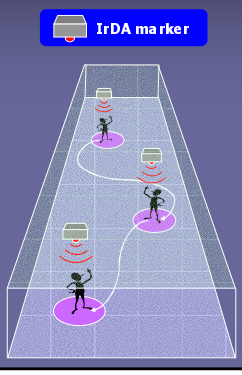
- **User's position**
- **User's orientation**
- **Contents database**



User's position
-Specification of the user's **absolute** position
-Estimation of the user's **relative** movement

Contents database
-Downloading from the networked **shared database**

Measurement of User's Position



Specification of absolute position

The system specifies the user's absolute position discretely using IrDA sensors.

Positioning error : within 1 meter

Estimation of relative movement

The system estimates the user's relative movement from IrDA position by using a pedometer.

Positioning error : within 5% of the user's walking distance (outdoors)

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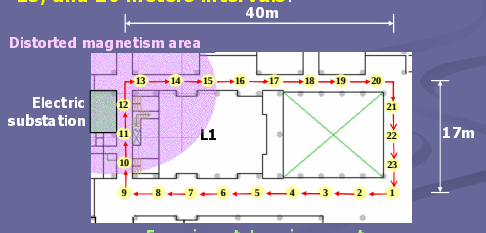
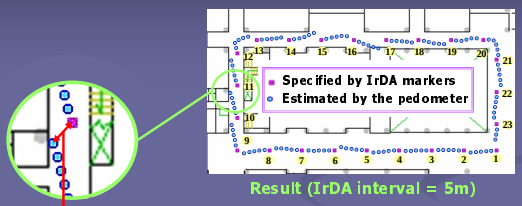
Experiment for Evaluating the Positioning Method

- It is held to investigate the relationship between the positioning errors and the intervals of IrDA markers.
- IrDA markers are arranged on the ceiling **with 5, 10, 15, and 20 meters intervals**.



Experimental environment

Experimental result

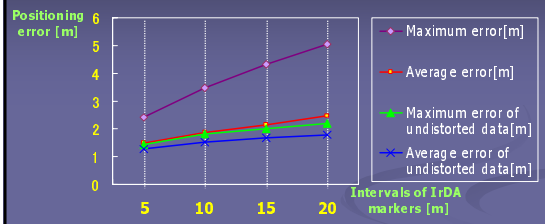


Result (IrDA interval = 5m)

The distance between specified position by the IrDA marker and the previous position.

We define it as the positioning error of the proposed positioning method.

Positioning error



- The positioning errors **increase** almost **linearly**.
- In undistorted magnetism area, positioning error is **below 2 meters** in any cases.

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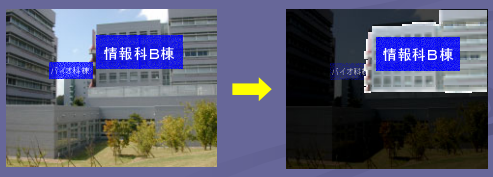
Research Purpose

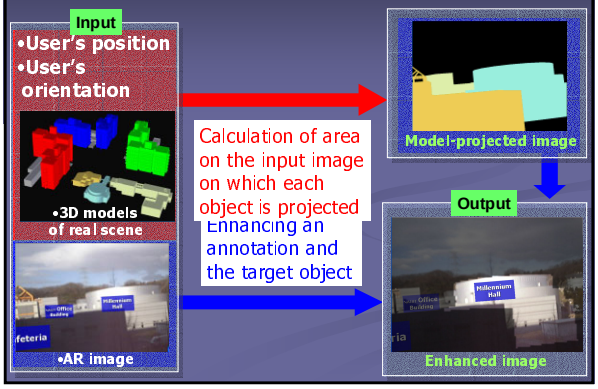
Presenting annotations for WARS users intuitively

Enhancing the annotation and its target object
to aid the user's intuitive link of
a virtual annotation and its real target



Examples of intuitive presentation of annotations

Approach



Preparatory Experiment

- User's position : **Fixed (B-3F)**
- User's orientation : Measured by **inertial sensor**

VIDEO

Summary and Future Work

- **Summary**
  - Evaluating the positioning error of the proposed positioning method
  - Describing my current work, intuitive presentation of annotations for WARS using 3D models
- **Future Work**
  Developing intuitive presentation of annotations using image processing techniques