Real-time Computer Vision
For Mobile Robot Navigation

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Seminar Outline

- Introduction
- Background & Motivation
- Implementation
- Schedule
- Conclusion
**Aims of the Navigation System**

1. To **navigate** using visual features, landmarks.

2. To construct a path between **multiple areas**.

To show that it is possible to use only visual cues to successfully navigate a path.

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*A Navigation Task*
Dynamic Landmark Testing

Bottom Back & Look Phase

- Backwards Movement
- Always Facing Towards Goal
- Virtual Field

Goal Position

Virtual Field
Landmark Navigation

- Pairing of snapshot and current image
- Displacement vector
- Summation by reliability
**Flowchart for learning & navigation**

1. **Learning Phase**
   - Start
   - Perform TBL Movement
   - Number of Locations Satisfied?
     - Yes
     - No
       - Perform Turn and 'Zero'
       - Redo Turn and 'Zero'

2. **Navigation Phase**
   - Reached Home Position Yet?
     - Yes
     - No
       - Perform Homing Movement

3. **Goal!**
Active TBL

The result of the active Turn, Back & Look phase

- Similar to TBL
- Maintains minimum number of landmarks
- Tries to maintain more ‘attractive’ field
Vision Validity Test

Example of ‘drift’ associated with odometric navigation

What vision based navigation is expected to achieve
Schedule

Chart for Project Progress to date

Multiple Areas

Navigation Exp. 1

Dynamic TBL

Navigation Exp. 2

Navigation Exp. 3

100%
Development Environment

Sony Pan-Tilt

Nomad 200

PII Processor

Camera Output

TV Output

Hardware and software configuration
Static Landmark Selection

A landmark that resembles its surroundings

A landmark that is quite distinct from its surroundings
Biological Inspiration

- Insect Based
- Complex Task
- Little Processing
- No 3D Model
- TBL Phase
- Static Landmarks Select
- Virtual Field
Potential vector fields after TBL movements

Potential navigation path
Conclusion

- With the use of a TBL phase it is shown to be possible to navigate through a path solely relying on landmark tracking.

- The virtual field produced aids in the ability to bound the movement during the navigation phase