Multimodal Interaction

Introduction

Dr Pradipta Biswas, *PhD (Cantab)*
Assistant Professor
Indian Institute of Science
http://cpdm.iisc.ernet.in/PBiswas.htm

Indian Institute of Science
CPDM

- More than 100 years old
- initiated iit, nit and iiser systems in india
- Only Indian university in the top 100 ranking
- Only Indian university in the top 10 small (<5k students) universities
- Centre for product design and manufacturing
  - Oldest design school in India
  - Pioneered in design research
  - Set up incubation centre for productization

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I³D Lab

Instructor's bio

- Assistant Professor at Indian Institute of Science

- Senior Researcher at Cambridge University (2010 - 16)
  - Worked with Technicolor, BT, BAE Systems, JLR

- Vice Chairman at ITU-T FG Smart TV and WG Coordinator at ITU –T FGAVA (2011 – 2013)

- PhD form Cambridge University (2006 – 2010)

- MTech from IIT Kgp (2004 – 2006)

Early computer - ENIAC
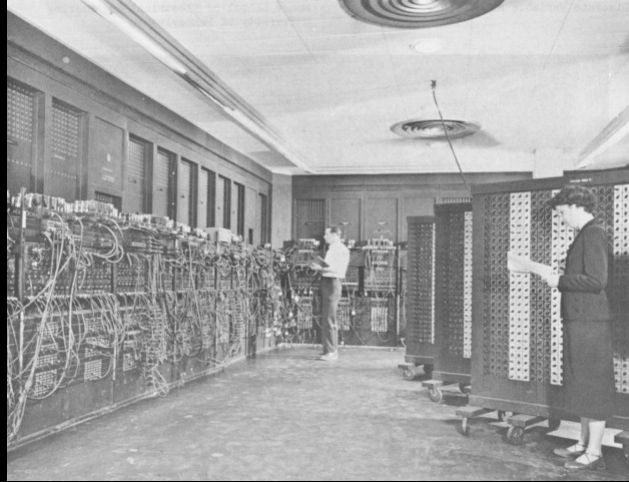
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IBM PC – 1980s

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Approx. time line (from Prof. B. Myers)

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Present status

Integration of TV and mobile devices

Gesture control and recognition (e.g. Microsoft's KI...)

Second screen: Tablet PCs

Smart Remote Controls

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What we get

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What we get – usability evaluation

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Aim of the course

- Basic knowledge of multimodal interaction

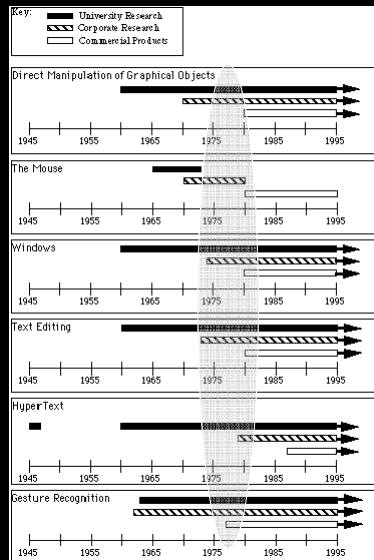- Exposure to state-of-the-art eye gaze, hand, head, finger movement and EEG trackers

- Developing new input modalities tracking eye gaze, hand, finger, head movement of users

- Multimodal fusion algorithms

- Validating new input modality

- Data analytics relevant to multimodal interaction

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Course structure – Day 1

- Introduction to Multimodal Interaction
- Why Multimodal – A case study of developing multimodal framework from EU GUIDE project
- Hand / Finger movement tracking technologies
- Demonstration of Hand / Finger movement tracking
--------Lunch Break-------------
- Setting up computers for software development
- Software development using MS Kinect and LeapMotion

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Course structure – Day 2

- Basics of Signal Processing and Multimodal Fusion Techniques
- Introduction to Eye Gaze and Head Movement Tracking
- Demonstration of Eye Gaze and Head Movement Tracking

--------Lunch Break-------------

- Software Development using Tobii EyeX to control a pointer on a graphical user interface
- Introduction to direct voice input and Microsoft Speech SDK

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Course structure – Day 3

- Introduction to Brain Computer Interface
- Demonstration of Emotiv Insight Dry Electrode EEG Tracker
- Experiment design and data analytics for validating Multimodal Interaction

--------Lunch Break-------------

- Developing a multimodal program for pointer control tracking both eye gaze and finger movement
- Mock user study and data analytics
- Conclusion

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What is Multimodal Interaction

- More than one input or output modalities

- Combining more than one modalities together into a single input
  - Mouse plus Eye Gaze movement

- Rendering output in more than one modality
  - Screen plus Spoken Text

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Applications

- Gaming Consoles

- Information Visualization

- Automotive Environment

- Aviation Environment

- Assistive Technology

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Advantages over unimodal systems

- Easier to use; Less training
- Robust, flexible
- Preferred by users
- Faster, more efficient
- Supports new functionality
- Applies to many different environments and form factors that challenge GUI, especially mobile ones

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Challenges

- Mismatch in latencies

- Different ranges of (in)accuracies of sensors

- Simultaneous input – setting precedence

- Quality of multimodal input or output

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