

# Mobile User Interface technologies

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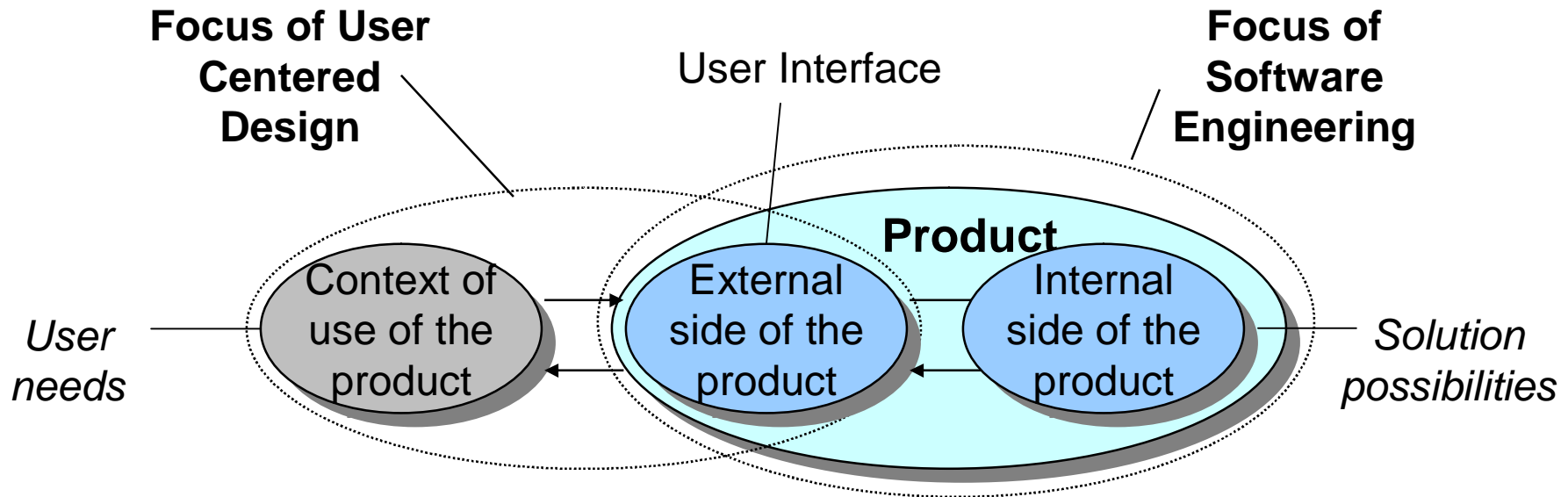
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# outline

- What is user interface?
- Pen-based UI
- Camera-based UI (/camera OCR)
- Hand-free gesture interaction through camera
- Multi-touch UI
- Touch UI based on tactile feedback
- Multimodal UI

# What is user interface (UI)?



- **User Interface** is the interface by which end users can interact with products.
  - UI is the window of products through which end users understand and operate.
  - UI is designed and improved with user experience.
  - UI is goal driven not device driven.
- Natural and intuitive UI is able to provide one direct solution for the conflict of device miniaturization and usability.

# Pen UI

- Keyboard/keypad-based input does not fit for many eastern languages
  - either too many letters, e.g., Thai, Hindi
  - or ideographic characters, e.g., Chinese, Japanese
- Pen input is the demand from
  - Not only text input
  - But also navigation, selections, etc. (as a mouse)
- **However, there is always limited screen space for pen input on a mobile display!**



# Pen UI

- Common features for most of existing pen UI
  - Candidate list window: 10 candidates
  - Modes: Chinese, English, Pen gesture, and all sets
  - Inline Editing: Supported
- Key issues to be considered for pen UI
  - Can the UI speed up the character input process?
  - Can the UI save the mobile display space?
  - Is the UI easy to use?



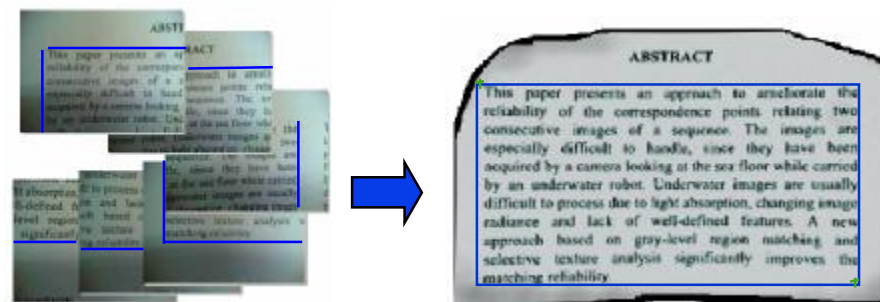
# Camera based UI

- Normally a camera is used to take images for **saving**.
- Now the functionalities of cameras are expanding for **inputting**.
  - Text scanning
  - Barcode reading
  - Camera mouse
  - etc
- Key issues to be considered for camera-based UI
  - Easy to use (easy UI for scanning images)
  - Hidden complexity
  - Sensible UI (intelligence)



# Camera OCR

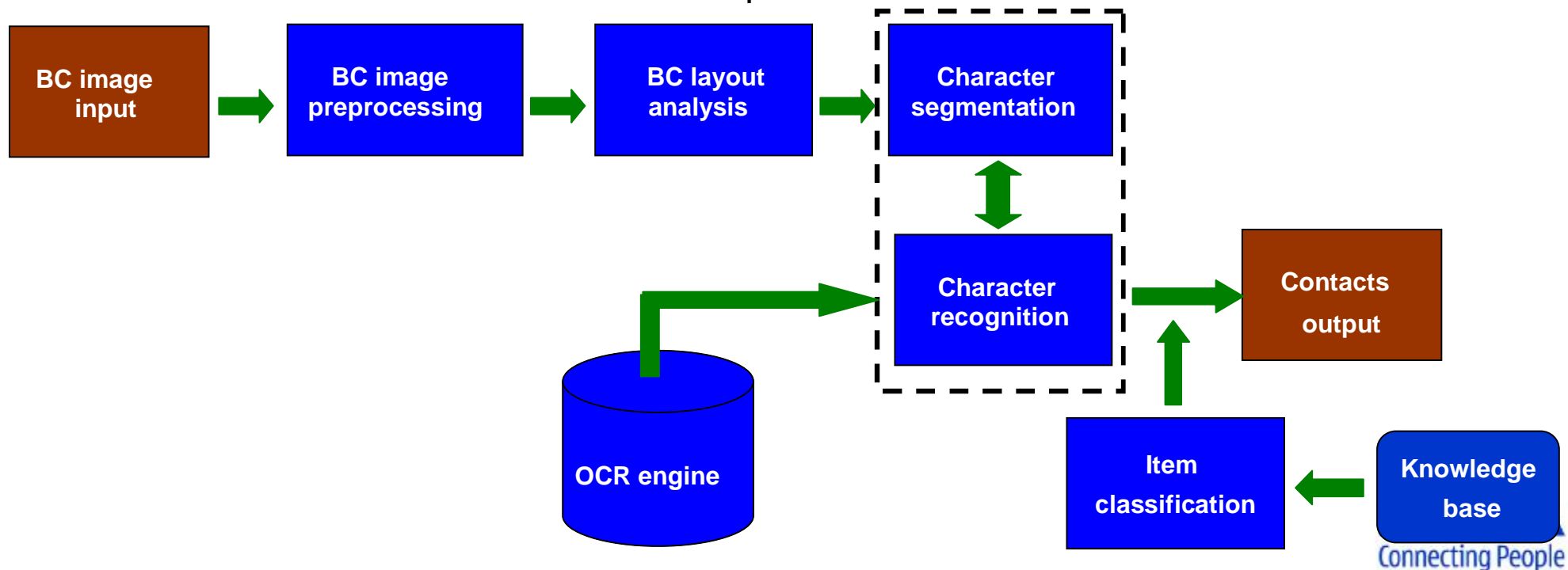
- **Business card reader**
  - Launched to the release of N90 in Oct 2005
- Shoot-to-translate on a bilingual/multilingual dictionary
- Notes taking
- etc



# Business card reader on camera phone

- **Core techniques in business card reader**

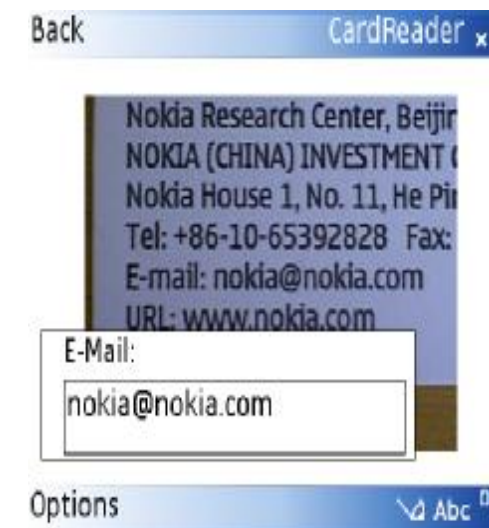
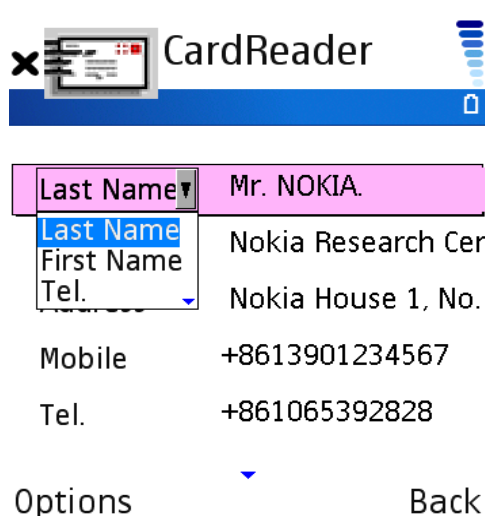
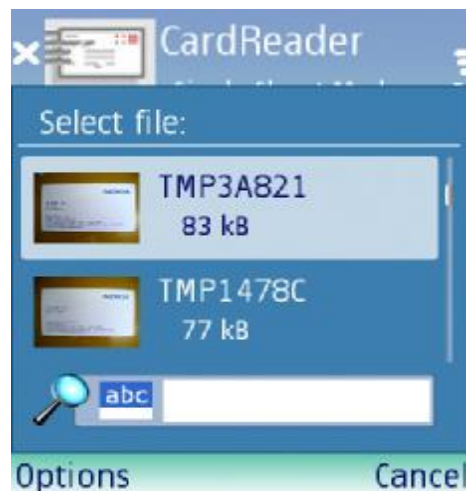
- Business card image preprocessing
- Layout analysis
- Character segmentation and recognition
- Item/contact classification
- Contacts on business card saved into phonebook



# Business card reader on camera phone

- **Key UI features of business card reader**
  - **Diverse input modes**
    - **Single shoot mode: Read a single business card once (default)**
    - **Multiple shoot mode: Read multiple business cards once**
    - **Load mode: Select and read the card(s) saved in the phone gallery**
    - **Shoot-to-do mode: Trigger an array of applications such as dial, browser, email or messaging clients**
  - **Features for experienced users**
    - **Two interactive interfaces for the business card layout adjusting and the recognition results correcting.**
    - **Item selection allows end users to make the selection of the item categories to be recognized and saved**
  - **Optical and digital zooms: the zoom adjusted last time can be remembered.**
  - **Sensible UI helps novices easily scan/input contacts.**

# Business card reader on camera phone



# The future of OCR technology

- **The geometric distortion of text images**
  - geometric distortion will distort characters' structures and take off the alignment characteristics of text to be proceeded.
- **Text extraction from scene images**
- **Handwriting and specific language scripts, e.g., Thai, Hindi, etc.**
- **Intelligent user interface for OCR applications**
  - Camera motion detection technology for automatic text image capture
  - Text image stitching technology
  - Easy selection of text to be recognized
  - Language script identification technology

# Hand-free gesture input technology through camera

- Input UI with QWERTY VKB
  - VKB can be either shown on screen or projected on a desk by LCD.
  - Camera detects finger X-Y coordinates which are further mapped onto VKB
- Command input through camera
  - Static & dynamic gestures (definition of gesture set)
  - UI navigation.



Signs



Up

Down

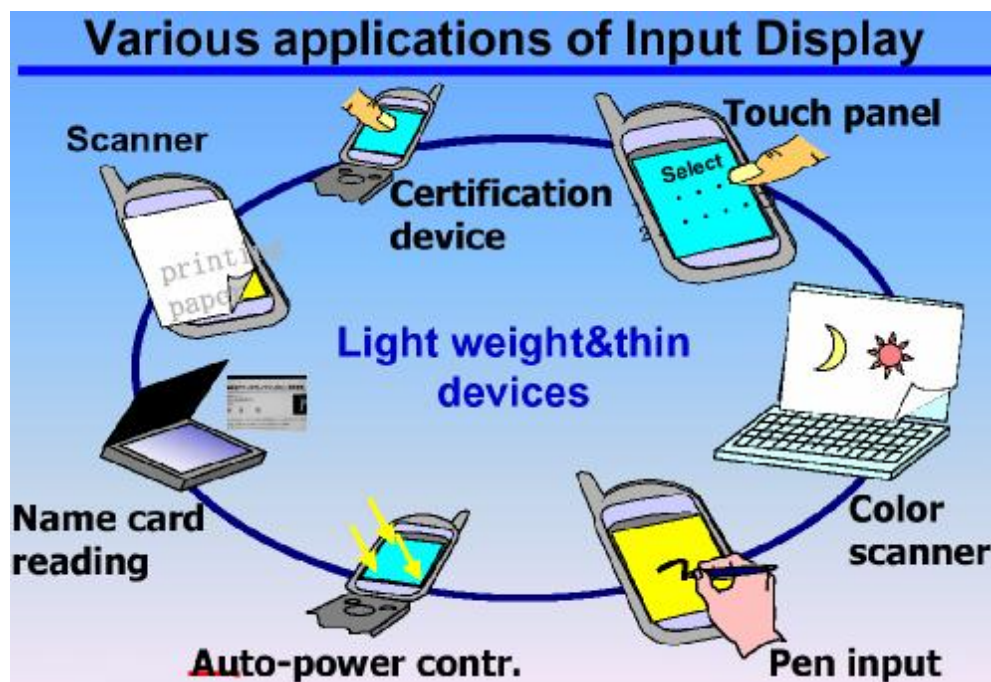
Left

Right



# UI on optical multi-touch screen

- **Opportunities and potential for differentiation**
  - Simultaneous detection of **MULTIPLE TOUCH**
  - Command/Pen input
  - biometrics of verification, fingerprint, hand shape
  - Optical scanning, name card reading, barcode reading
  - others



# Multimodal UI



Walking



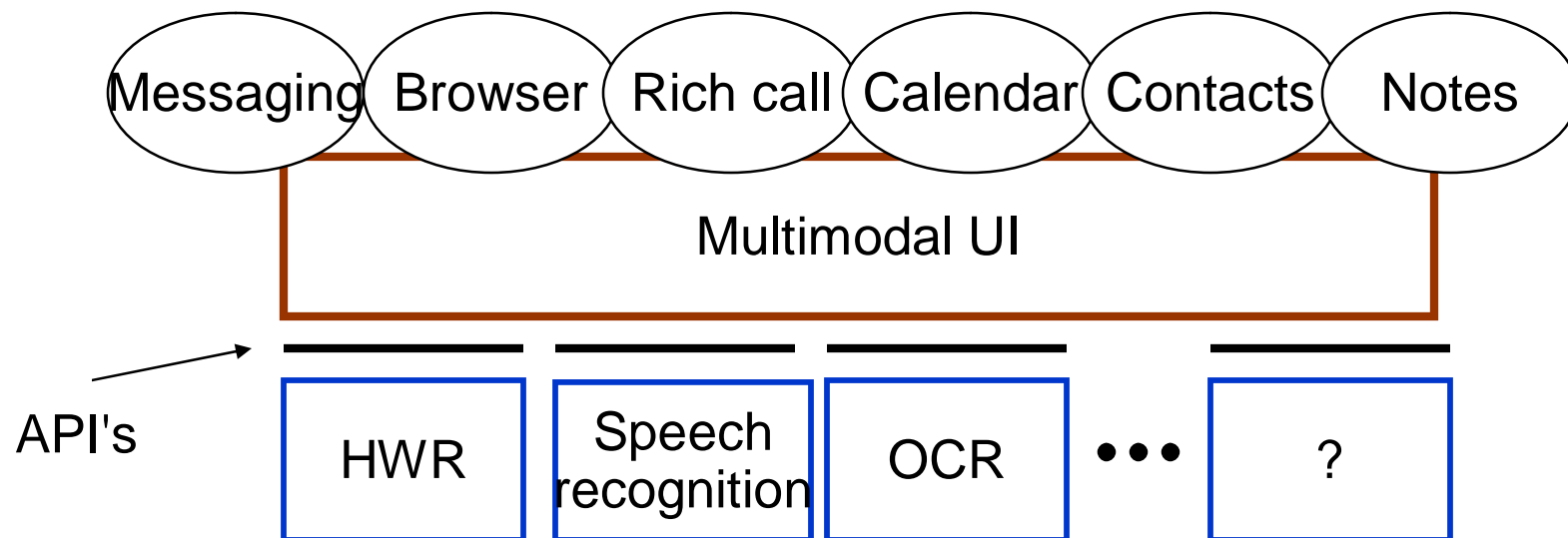
Commuting



Working at office

- Target: Maximum UI efficiency in different usage situations
- Multimodal UI means a UI system where all/most operations are operable by several input choices, e.g., by keypad, pen, camera, voice, etc.

# Multimodal UI Structure



**Thank you for your time!**  
**Q&A**