The TouchType
A mobile communication device for the blind and deaf-blind.

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OVERVIEW

- Introduction
- Comparable Products
- Product Implementation
- Sustainability and Bottom Line
- Social and Community Impact
- Presentation Recap
A blind and deaf-blind mobile communication device implementing GSM.

- Implements a solenoid system for user display and a Braille keypad for user maneuverability.

- Utilizes features related to cellular telephones.
  - Speed dial, contact storage, vibrating notification, etc.

- Marketed for deaf-blind users, but incorporated for blind and Braille-competent users as well.
COMPARABLE PRODUCTS

- Prototypes and concepts comparable to the Touchtype.
  - Touch Messenger by Samsung. [1]
  - Braille Phone by Spice Telecom. [2]
  - B-Touch by Zhenwei You. [3]

- TouchType incorporates effective product aspects while disregarding costly additions.

- Main advantages of TouchType: affordability and simplicity.
COMPARABLE PRODUCTS

- **Touch Messenger**
  - 2 character input keypad
  - 14 character display
  - Prototype only

- **Braille Phone**
  - Multi-tap input keypad
  - No text-messaging
  - Concept only

- **B-Touch**
  - Braille bump touch-screen
  - Message playback via voice synthesis
  - Concept only
PRODUCT IMPLEMENTATION

- **Hardware Requirements**
  - Microcontroller, peripheral devices, communication, etc.

- **Software Requirements**
  - Real-time preemptive kernel, main functions, etc.

- **User Interface**
  - Simplicity and intuitiveness.
PRODUCT IMPLEMENTATION

Hardware Requirements

- **Hardware**: Microcontroller, GSM module, Braille keypad, solenoid display, headphone jack, text-to-voice synthesizer, speed/volume control, vibrating motor, and dual power-supply.
PRODUCT IMPLEMENTATION
Hardware Requirements

- **Microcontroller**
  - Freescale 9S12DP512: 16-bit bus, 25 MHz frequency, SPI, SCI, GPIO.

- **GSM module**
  - Controls communication gateway between TouchType and other communication devices.
  - Support for GSM, GPRS, and TTY.

- **Braille keypad**
  - Multi-tap buttons.
  - 13 for alpha-numeric, 1 for punctuation, and 3 for user functions.
PRODUCT IMPLEMENTATION

Hardware Requirements

- **Solenoid display**
  - 6 solenoids create the standard English Braille layout.
  - Firing speeds controlled by speed/volume control.

- **Headphone jack**
  - Enables blind users to listen to messages.
  - Load detection for switching between Blind and Deaf-Blind Modes.

- **Text-to-voice synthesizer**
  - Supports Blind Mode’s voice recall.

- **Speed/volume control**
  - Implemented using a potentiometer.
  - Controls solenoid firing speeds while in Deaf-Blind Mode, and controls headphone volume while in Blind Mode.
PRODUCT IMPLEMENTATION
Hardware Requirements

- **Vibrating Motor**
  - Notifies user of different function entries and system alerts.
    - Send message, receive message, store contacts, button press, etc.

- **Dual power-supply**
  - Controls power distribution of rechargeable battery or AC plug-in.
  - Helps conserve power for continuous use of device.
PRODUCT IMPLEMENTATION
Software Requirements

- **Software**: MicroC/OS-II, GSM transmit/receive, Braille input, Braille output, text-to-voice converter, vibrating motor control, headphone load monitor, and power monitor.

- **MicroC/OS-II**
  - Pre-emptive real-time kernel which controls priorities for all functions mentioned below.

- **GSM transmit/receive**
  - Controls transmissions and receptions of a messages.

- **Braille input**
  - Accurately stores messages entered through keypad.
  - Monitors for specific button pressed and time-delays between multi-taps.
  - Corrects switch de-bouncing.
PRODUCT IMPLEMENTATION
Software Requirements

- **Braille output**
  - Displays recalled message one character at a time through solenoids.
  - Controls firing speed corresponding to the potentiometer setting.

- **Text-to-voice converter**
  - Converts text message into playable audio message, and sends the message to headphone jack.
  - Controls volume corresponding to the potentiometer setting.

- **Vibrating motor control**
  - Enables vibration patterns depending on current user situation.
PRODUCT IMPLEMENTATION
Software Requirements

- Headphone load monitor
  - Monitors headphone jack for appropriate load.
  - Controls whether device is in Blind or Deaf-Blind Modes.

- Power monitor
  - Monitors power consumption, and appropriately controls power per peripheral device.
PRODUCT IMPLEMENTATION
User Interface

- Simple to learn multi-tap system with intuitive button features.
- Several features include message recall, message sending, and contact storage.
- Detailed description of these features illustrated in accompanying paper.
SUSTAINABILITY AND BOTTOM LINE

- Incorporate RoHS certified parts to address environmental issues.
- Cost of initial prototype: ~$310.
  - Price only reflects previously mentioned hardware with component (resistors, capacitors, inductors) wiggle room.
- Cost of closest comparable device on the market (i.e. Braille displays): $1,400-$15,000. [4,5]
  - Between 450% and 4800% greater than cost of initial prototype.
- In the U.S., 2.5 million people are blind, 70,000 to 100,000 of which are also deaf. [6,7]
- Worldwide, 314 million people are visually impaired, 87% of whom live in developing countries. [8]
The TouchType as a multi-faceted, modern device.
Features attained and disregarded from comparable prototypes and concepts.
Physical implementation of a simple idea.
Product sustainability and social impact on the local as well as global community.
REFERENCES

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