

# Chapter 8.11

## An Interactive Wireless Morse Code Learning System

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### INTRODUCTION

Morse code has been shown to be a valuable tool in assistive technology, augmentative and alternative communication, and rehabilitation for some people with various conditions, such as spinal cord injuries, non-vocal quadriplegics, and visual or hearing impairments. In this article, a mobile phone human-interface system using Morse code input device is designed and implemented for the person with disabilities to send/receive SMS (simple message service) messages or make/respond to a phone call. The proposed system is divided into three parts: input module, control module, and display module. The data format of the signal transmission between the proposed system and the communication devices is the PDU (protocol description unit) mode. Experimental

results revealed that three participants with disabilities were able to operate the mobile phone through this human interface after four weeks' practice.

### BACKGROUND

A current trend in high technology production is to develop adaptive tools for persons with disabilities to assist them with self-learning and personal development, and lead more independent lives. Among the various technological adaptive tools available, many are based on the adaptation of computer hardware and software. The areas of application for computers and these tools include training, teaching, learning, rehabilitation, communication, and adaptive design (Enders, 1990;

McCormick, 1994; Bower et al., 1998; King, 1999).

Many adapted and alternative input methods now have been developed to allow users with physical disabilities to use a computer. These include modified direct selections (via mouth stick, head stick, splinted hand, etc.), scanning methods (row-column, linear, circular) and other ways of controlling a sequentially stepping selection cursor in an organized information matrix via a single switch (Anson, 1997). However, they were not designed for mobile phone devices. Computer input systems, which use Morse code via special software programs, hardware devices, and switches, are invaluable assets in assistive technology (AT), augmentative-alternative communication (AAC), rehabilitation, and education (Caves, 2000; Leonard et al., 1995; Shannon et al., 1981; Thomas, 1981; French et al., 1986; Russel & Rego, 1998; Wyler & Ray, 1994). To date, more than 30 manufactures/developers of Morse code input hardware or software for use in AAC and AT have been identified (Anson, 1997; <http://www.uwec.edu/Academic/Outreach/Mores2000/morse2000.html>; Yang, 2000; Yang, 2001; Yang et al., 2002; Yang et al., 2003a; Yang et al., 2003b). In this article, we adopt Morse code to be the communication method and present a human interface for persons with physical disabilities.

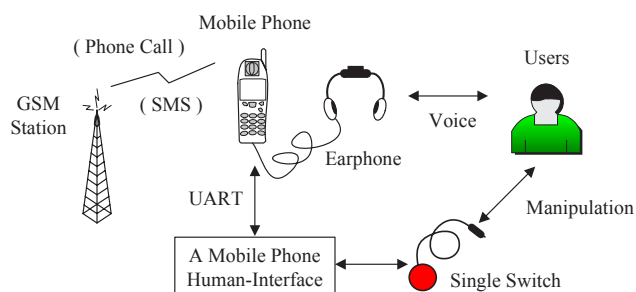
The technology employed in assistive devices has often lagged behind mainstream products.

This is partly because the shelf life of an assistive device is considerably longer than mainstream products such as mobile phones. In this study, we designed and implemented an easily operated mobile phone human interface device by using Morse code as a communication adaptive device for users with physical disabilities. Experimental results showed that three participants with disabilities were able to operate the mobile phone through this human interface after four weeks' practice.

## SYSTEM DESIGN

Morse code is a simple, fast, and low-cost communication method composed of a series of dots, dashes, and intervals in which each character entered can be translated into a predefined sequence of dots and dashes (the elements of Morse code). A dot is represented as a period “.”, while a dash is represented as a hyphen, or minus sign, “-”. Each element, dot or dash, is transmitted by sending a signal for a standard length of time. According to the definition of Morse code, the tone ratio for dot to dash must be 1:3. That means that if the duration of a dot is taken to be one unit, then that of a dash must be three units. In addition, the silent ratio for dot-dash space to character-space also has to be 1:3. In other words, the space between the elements of one character is one unit while

Figure 1. System schematics of the mobile phone human-interface



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