

BRAILLETECH: ELECTROBIOMECHANICAL DEVICE FOR INCEPTIVE BRAILLE LEARNING

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ABSTRACT

The present paper displays the design process and characteristics of the BrailleTech. BrailleTech is a low-cost teaching device that encourages pre-K through 1st-grade children to learn the alphabet and acquire letter recognition skills through interactive methods that stimulate their tactile and auditory senses. It is programmed through Arduino and includes passive infrared sensors (PIR), a DF player SD, and solenoids. The solenoids act as braille dots to display letters, depending on their pattern, while the speaker informs the child of the letter that is currently shown. The device is an electrobiomechanical device programmed to coordinate the spelling of the letter with the electromechanical movement of the related audio and the appropriate braille dots solenoid representation. The device responds to the child's motion that the sensors perceive and activates other functions that are constantly repeated each time the sensor is activated. The objective is to aid young children to progress from pre-literacy to literacy in an enjoyable and simple manner.

Keywords: Electrobiomechanical, Braille, solenoid, initial learning

INTRODUCTION

The history of Braille dates to the early 1800s when Charles Barbier developed a unique system known as "night writing." This system was based on a 12-dot cell, two dots wide and six dots tall, representing a letter or phonetic sound. Louis Braille then created a reading method based on a six-dot cell for the fingertip to take-up the entire unit with one-touch [1]. Currently, this system is utilized to touch reading and writing for the blind in which raised dots contain equivalents for punctuation marks and provide symbols to show letter groupings.

According to the 2017 American Community Survey (ACS), approximately 568,202 children have vision difficulty, while 63,657 children, youth, and adult students are legally blind in educational settings. Pre-readers and primary Braille readers compose 24.2 percent of this statistical portion [2]. Thus, pre-literacy plays a critical role in processing the systematic language and stimulating their tactile and visual cortex. Nevertheless, access to Braille educational material is expensive. However, as of 2016, about a million visually impaired Americans, nearly one in five, live in poverty. This gives them less access to educational resources, leading to a lower education level than the general population [3].

Because of the limited access to educational Braille resources due to the high prices and non-targeted functions. Besides the shortness of the materials for learning and reviewing Braille, the visually impaired and legally blind have a lower educational level [4]. This project aims to narrow the literacy gap by introducing an innovative Braille device that teaches these children the alphabet to ensure good fundamentals of pre-literacy and facilitates their access to the educational system.