

1. INTRODUCTION

The development of a child's motor skills starts when the child is born until the age of 6 years old [1] [2]. In this age range, the child's motor development will increase rapidly and is known as the golden age of growth. In general, children's motor development divided into two groups, namely fine motor development and gross motor development [3]. Fine motor development is an event of physical development which includes activities involving small muscles (hands) and coordination between the hands with the eyes or other senses that ensures accuracy in motion [4] [5]. In the golden age range, children must get a stimulus to ensure that the child's fine motor development achieved [6] [7] [8]. Examples of activities to stimulate fine motor development are throwing and capturing objects [7]. When the child throws the ball, the child makes visualization of how fast and how high the object thrown, then responds by throwing the item correctly.

There are official instruments for evaluating fine motor development in each country, for example in Indonesia using the "Pre-Development Examination Questionnaire (KPSP)" [9], while in the United States using the Denver Development Screening Test (DDST) and Centers for Disease Control and Prevention (CDC) checklist [10] [11] [12]. Children must be trained and given stimulus to complete motor development checklists. According to Grantham-McGregor et al. in his research about the effects of stimulation for the development of stunting children, the most effective stimulus for children is implemented stimulus in games [13]. According to the Montessori theory, the form of stimulus must be related to children's daily activities because it is related to physical abilities and independence of children in solving problems [14] [15]. Games that involve small muscles and eye-hand coordination are Bag Toss games [14]. The rule of the Bag Toss game is to throw a beanbag into the board hole that has provided. Because the Bag Toss game requires independence and concentration, this game is suitable for children with a minimum age of 5 years and above.

In Indonesia, children at the age of 5 and 6 already attend school at the kindergarten level [16]. At school hours, parents can no longer provide a direct stimulus for the child's motor development. The issue in this research is how to make a Bag Toss game that can help teachers in schools to provide a stimulus for fine motor development to children and provide automatic recording and processing of data on game activities. Additional is how the data from the activities can be accessed by parents anytime and anywhere. To resolve this issue, we built a system that can perform data reading at the initial node, processing data in the cloud, and presenting data at the user's node. All communication between nodes and the cloud uses the internet network. In the process of reading, processing, and presenting data carried out automatically between machines to machines (M2M), and because the implementation of this system for educational fields and devices, this system is referred to as the Internet of Educational Things (IoET) [17] [18].

The methodology of this research following 5 steps, namely a study of literature, data collection, system design, device testing, and analysis of results. The study of literature is a stage to collect references regarding IoT devices and children's fine motor development. The references that have been obtained then combined in the data collection stage. Furthermore, the IoT device will be designed in the system design stage and after that, the device will be tested in the device testing process. The results of the device testing process will be analyzed in the analysis results stage.

This research conducted to build Bag Toss system based-on IoET and analyze system performance based on functionality tests, system performance, and child assessment. Functionality testing carried out to validate all components of the system working correctly by predetermined functions. System performance testing tests the accuracy of reading, processing, and presenting data for each activity undertaken. Child assessment conducted to see the condition of children's fine motor development after playing Bag Toss. Scenarios to test the system performed with two levels of throwing distance.

This study consists of six parts, an introduction that discusses the background of the study. The next section discusses related studies, which include research on stimuli of fine motor development in children. The originality of this study explained in third chapter. The technologies adopted in this study, the rules of the Bag Toss game and the proposed solutions implemented in this study discussed in the fourth chapter. The fifth chapter discusses the detailed proposed solutions implemented. The results of the system built in the previous chapter were experimented and analyzed based on predetermined testing parameters. The final chapter concludes with the results of studies, methodology, implementation, and analysis of system results.