

## Drone Adjustment Play Block Coding System for Early Childhood

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**Abstract.** Technology has developed rapidly as the fourth industry revolution has started around the world. Almost all of our surroundings are becoming IoT. In this regard, software-related education is being promoted around the world. Coding education is active in almost all institutions such as elementary school, junior high school, and high school, and a coding education craze is blowing in kindergarten education. Kindergarten coding education is aimed at education using play. In this paper, we study a system that understands the principle of coding through drones play which can induce interest of infants.

**Keywords:** Drone, Coding, Flight Control, Infant Education, Software bridge.

### 1 Introduction

As the fourth industrial revolution is taking place all over the world, the importance of software education is emphasized. Therefore, coding education, which is the basis of software education, is becoming a mandatory subject for human resource development. However, understanding algorithms for building software requires a lot of effort and mathematical comprehension. So many students think away from the class and get away. A variety of educational materials and teaching aids are needed to learn algorithms for software education. Currently there are many programs and algorithms for software education, but there is still a lack of playable programs for infants and toddlers. In this paper, we use drone to provide interest to children, and to teach coding education to accumulate order of thinking power through block play. This will be very helpful in developing computer thinking skills. In addition, the drones are developing rapidly as a kind that can play a key role in the fourth industrial revolution, which can be very helpful in learning drone flight in the future.

Our coding system utilizes the movement of the hand to match the characteristics of infants and toddlers. You can use the play block to accumulate the order in which the planes move and check the planes moving according to their accumulated order. This helps to develop thinking ability to think about the movement of an object in advance and to develop a habit of predicting behavior, which is helpful for nurturing human resources in the future.

## 2 Related Works

In the reality that the fourth industrial revolution is spreading rapidly, the drone is becoming a new culture. The drones that started with unmanned surveillance vehicles are developing in the whole part of our lives such as agriculture, logistics, aviation employment, leisure utilization, real estate, toys. The future drones will permeate as part of our lives, and various control methods will come in. Currently, drones are actively used in logistics, transportation, and agriculture, and will develop in the future as a whole [1]. Demonstrations are increasing every year at the exhibition hall of the International Electronics Fair, the world's largest consumer electronics IT products exhibition. This means that the drone industry is likely to develop into a core technology of the future. The drones that are currently commercially available are almost universally open-source based platforms. This is cost-effective and is good for educational use and play. By using this, it is possible to learn the principle of remote control of external physical devices such as sensors and motors.

**Drones** : Recently, researches on UAV or drones called UAV have been actively conducted according to the development of sensors, materials, and control technology for the last 10 years. Leading companies such as Google, Amazon, and DHL and leading research institutes of the European Union are spurring the development of related technologies, demonstrating their services using drones, and increasing their interest in various applications. .

In addition, recent studies have been conducted on the use of drones to perform physical operations without space limitations, such as facility maintenance, not for simple flight and reconnaissance purposes, It is an example that shows.

Drone is a word that collectively refers to various types of UAV, and its shape, size, and application fields are different according to purpose such as military use and commercial purpose. Drones can be divided into fixed wings, helicopters, and multi-rotor types according to their types. The fixed wing is controlled by moving the wing of each wing in the same form as a normal aircraft, and it is possible to fly at a high structural speed

Although there is an advantage that a high lift can be obtained even with a small thrust, there is a restriction in terms of its usability due to the impossibility of stopping the flight. On the other hand, a helicopter requires high thrust, but it has the merit of being able to approach and work in various areas because it is possible to stop flight. However, there is a disadvantage that the rotor mechanism for control such as swashplate is complicated and the control itself is difficult. On the other hand, multi-rotor type drone is fly by rotor like helicopter but it can be controlled by simply changing the speed of each rotor, so it is very simple in structure and easy to manufacture and control

There are advantages. Such multi-rotor type drones have become possible due to the recent rapid development of various field technologies, including related materials / production technologies such as carbon fiber, high efficiency motor and battery technology, lightweight MEMS based sensor technology for flight, High-performance on-board computer and communication technology, state estimation and control technology, SLAM and positioning technology. The above-mentioned advantages and the points of contact with these various technologies are that drones can be actively used for various purposes such as commercial, broadcasting, It became the base

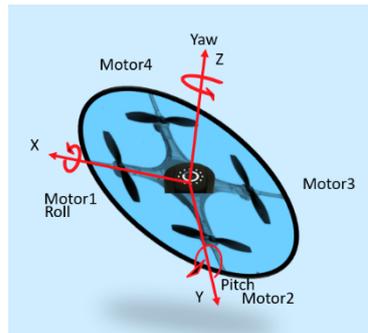
**Dron's core technology :** The core technology of drones requires frame technology to lower the weight while maintaining the stability and strength of the drone gas to extend the flight time. It is also necessary to provide the power of drones, the air-based movement model of the aircraft, the unmanned navigation system, circuit and motor technology for posture and altitude control, and the development of the flight controller. It also requires a number of technologies, including hardware design and fabrication techniques for controlling apparatus and communication technology.

Recently, drones also create special drones to use for special purposes, such as autonomic driving and logistics combined with virtual reality. De Ron's most core technology is the control technology of FC. To control drones, the FC uses a way to control the three-axis moment, commonly called roll, pitch, and yaw. You can define a 3-axis moment relative to the front of the Dron, and define the horizontal movement, the rear movement, the left and right rotation direction respectively, the roll, pitch, and yaw.

You can control these three moments to fly freely into the hover ring, advance, reverse, left and right, which is a technology that flies in place.

In this case, the sensor used to control the position of the speed position, the three-axis speed of the gas, the IMU sensor to measure velocity, acceleration, etc., the atmospheric pressure sensor to measure the difference in altitude atmospheric pressure, and the measured sensor data to control the gas using various control techniques and filtering techniques.

Quadcopter refers to a case where the number of propeller of multi-rotor type drones is four. The propeller is all aligned in one direction. It can be driven in the aligned direction and rotated in three directions. The input has four in total. It can move and rotate in three axes of X, Y, Z in three dimensional space, so it has total 6 degrees of freedom. The control input is the rotor's 4 thrust, 4 degrees of freedom [2-5]. Figure 1 shows a quadruple coordinate axes definition of the drones, which allows three-axis rotational movement.



**Fig. 1.** Quadruple Coordinate axes Definition

### 3 Drone Adjustment Play Block Coding System for Early Childhood

This paper proposes a coding education system for infants and toddlers. Unlike conventional controls, it is possible to control for block play. Coding for block play combines all the scenarios imaginable in driving and flying to create diverse content and allows for flying lessons that take into account the safety of infants and young children. It makes software training possible in conjunction with entry. Figure 2 is Block Coding drone's control System.

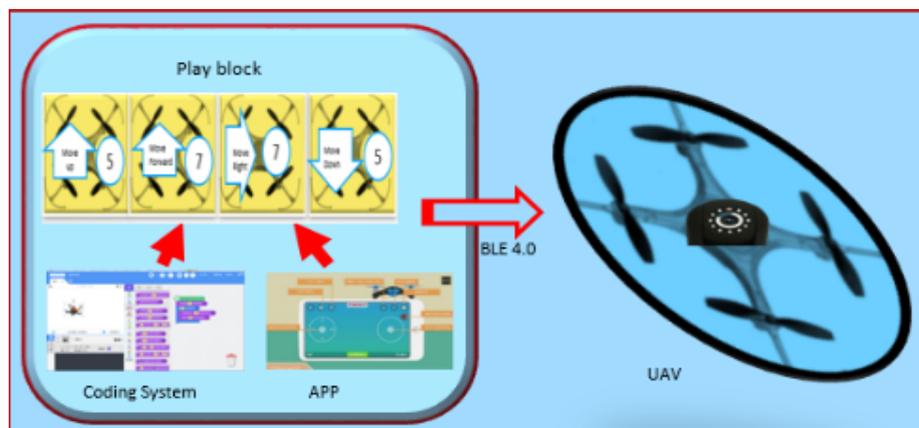


Fig. 2. Block Coding drone's Control System

Table 1. Play Block Coding

Move up	Move Down	Rotate Left	Rotate Right
Move Forward	Move Back	Move Right	Move Left

H / W consists of a UAV H / W module for coding education. Its size is 15-16cm in diameter, 400g in weight, material is PLA, PC material, plastic and iron, and the product consists of FC board connection, and motor respectively.

It utilizes a regulator that is controllable in the block coding system and performs 1:1 communication. It communicates using Bluetooth communication 4.0. Children can

adjust the start, end, rise, fall, motor rotation, back and forth, left, right, up and down, flight angle and trim to provide infants with fun and play activities. The functions of the block are basically starting, rising, falling, forward, backward, and rotation, and all four rotations of the propeller are controllable. The system can also measure the height from the ground and allow to go up to the height of the selected height in advance so that the distance from the Bluetooth is not cut. Table 1 is the movement of the play block. Move drones to the meeting of the pieces that put the motion block.

#### **4 Conclusion**

As the Fourth Industrial Revolution erupted, various applications for drones are increasing. In line with this, we want to improve infants' thinking ability by using drones and study how to learn various principles such as flying, turning, and landing. We will work with block and cue to combine entry and scratch to understand the coding principles of toys moving to infants and to provide a sense of toys with activity. It takes the path of the drone in advance and makes the movement into a play block and watches the plane fly by the order of the play blocks created. Children who do this can help to improve their thinking skills by allowing them to think in advance of the movements of all things and to set order. In the future, we will study drones and augmented reality system, which can play drone games by flying the drones

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