# A TEACHING APPARATUS FOR SIMULATING AN EXECUTION OF A COMPUTER PROGRAM

## FIELD OF INVENTION

The present invention relates to a teaching apparatus. More particularly, a teaching apparatus using a plurality of block toys to simulate an execution of a computer program or computer programming language.

## BACKGROUND OF THE INVENTION

Programming has undoubtedly become the new language of the world in recent years due to technological advancements and the plethora of opportunities they have brought about. Engineers can communicate their ideas and manage computer programs using programming languages, which are collections of instructions that generate different types of outputs. In the future, being able to code will be a general skill, thus kids should start learning programming languages early. more significantly, since programming language relies heavily on logical reasoning, knowing it can help kids become smarter. However, most parents may find teaching children to code to be complicated, therefore, it is crucial to pique their interest and to understand the general concept of programming during playing in a more intuitive way, so coding training and learning materials are needed for parents or early childhood educational institutions to get children to know coding with fun.

Various technologies have been developed to enhance this type of teaching apparatus. For example, a United States patent with publication no. US20220001292A1 discloses a programmable assembly toy system, including a multiplicity of first function modules, each of the first function module having a first surface to fit into one or more parameter modules, each parameter module having a memory for storage a computer

program command forming a computer program with each parameter module; and a physical representation object connected with a trigger module in a wireless connection or a wired connection and performing a preconfigured action; wherein the trigger module is jointed with one or more first function modules responsive to an external trigger action to trigger the preconfigured action.

A Korean patent with publication no. KR20180013487A discloses an educational robot system comprising a robot operating according to a predetermined algorithm, an auxiliary input means for detecting an acceleration of the robot, coding blocks representing each of the operation units for configuring the algorithm, a coding board having a block seating part for placing the blocks according to the intention of the user, and an algorithm generation/control unit for generating the algorithm according to the coding blocks arranged on the coding board and controlling the operation of the robot according to the generated algorithm, wherein the algorithm generation/control unit may adjust the algorithm or operate the robot according to a value detected by the auxiliary input means.

Another Korean patent with publication no. KR102067666B1 discloses a coding education device utilizing the movement of a robot, and includes a board member having a movement path, and a coding robot body that recognizes the movement path and moves along the movement path, wherein the movement path includes a main movement path section indicating a main movement path along which the coding robot body moves, and an operating point section located on one side of the main movement path section for causing the coding robot body to recognize and perform a preset movement, thereby enabling children in kindergarten or lower grades of elementary school to easily understand the basics of coding through changes in output according to an input target, and improving accessibility to coding learning and enhancing learning effectiveness for children in kindergarten or lower grades of elementary school by utilizing the movement of the coding robot body.

One United States patent with publication no. US10585649B2 recites an an electronic block kit system for scratch programming. And more particularly, the present disclosure relates to an electronic block kit system which includes electronic blocks of hardware shapes each corresponding to instruction blocks of the scratch programming, which are used in the program coding education, and executes a program controlling a sprite in accordance with a program flow chart when the electronic blocks are connected along the program flowchart. The electronic block kit system includes: a master electronic block connected to the smart terminal and configured to form a data communication path with the smart terminal and receive a supply voltage; and a plurality of slave electronic blocks. The slave electronic block can be combined with one of the master electronic block and a different slave electronic block. The master electronic block is disposed and the plurality of slave electronic blocks are cascade-combined to a lower portion of the master electronic block. The slave electronic block forms the data communication path with one of the master electronic blocks and the different slave electronic block, which is combined with an upper portion of the slave electronic block, and receives the supply voltage from the combined upper electronic block.

**SUMMARY OF INVENTION**

An object of the present invention is to provide an apparatus that can simulate the execution of a computer program or say a flowchart in a more intuitive manner that can be easily understood. It is also an object of the present invention to provide an apparatus that is customizable to cover a wide syllabus of executable computer programs.

In one aspect of the present invention, there is provided a teaching apparatus for simulating an execution of a computer program, the apparatus comprising a plurality of function blocks, each of the function block having a receptacle extending therethrough that when combined with a corresponding function block, the receptacles form a track

that simulates an execution of the computer program; and a mobile unit configured to navigate along the track of the combined function blocks; wherein the function blocks include one or more decision blocks which are each configured with assigned recesses to receive one or more parameter blocks, such that the decision blocks are equipped with movable obstructions in the receptacles that are actuatable to allow passage of the mobile unit in response to the receipt of the parameter blocks with an appropriate setting as dictated on the parameter blocks.

Preferably, the function blocks further include one or more terminal blocks, one or more flowline blocks, and one or more process blocks.

Preferably, the terminal blocks indicate a start and an end of the simulated computer program.

Preferably, the flowline blocks are configured with arrowed indicators that indicate a direction of execution of the simulated computer program.

Preferably, the process blocks are configured for providing an audio notification in response to the mobile unit navigating through said process blocks, in which the audio notification indicates a successful execution of the simulated computer program.

Preferably, the receptacles are rectangular or oval in shape with a circular termination.

Preferably, the mobile unit comprises of an anchor configured in a shape of an elongated member with a spherical termination, with the anchor beings fixed to a bottom portion of the mobile unit.

Preferably, the mobile unit is either mechanically actuated or battery-operated.

Preferably, the parameter blocks with a switch between two states represent binary functions that indicate a True statement and a False statement respective of the simulated computer program.

Preferably, the receptacle on the decision block is forked into independent opposing receptacles, each one representing the True statement and the False statement of the binary function respectively.

Preferably, the movable obstructions are actuated upon inserting the parameter blocks correctly into the assigned recesses on the decision blocks according to True statement or False statement as dictated by the simulated computer program.

One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiment described herein is not intended as limitations on the scope of the invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawing the preferred embodiments from an inspection of which when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

**FIG. 1** illustrates a preferred embodiment of a teaching apparatus for simulating an execution of a computer program comprising a mobile unit and a plurality of function blocks.

**FIG. 2** illustrates an exemplary embodiment of the mobile unit used in the simulated computer program.

**FIG. 3** illustrates an exemplary embodiment of a terminal block as part of the function blocks.

**FIG. 4** illustrates an exemplary embodiment of the mobile unit placed on the terminal block.

**FIG. 5** illustrates an exemplary embodiment of flowline blocks and process blocks as part of the function blocks.

**FIG. 6** illustrates an exemplary embodiment of decision blocks as part of the function blocks.

**FIG. 7A** is a cross-sectional view illustrating an exemplary embodiment of the decision block with an "AND" operation.

**FIG. 7B** is a cross-sectional view illustrating an exemplary embodiment of the decision block with an "OR" operation.

**FIG. 7C** is a cross-sectional view illustrating an exemplary embodiment of the decision block with a "NOT" operation.

**FIG. 8** illustrates an exemplary embodiment of parameter blocks with different shapes to be received into the decision blocks.

**DETAILED DESCRIPTION OF THE INVENTION**

Hereinafter, the invention shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

The invention will now be described in greater detail, by way of example, with reference to the drawings.

**FIG. 1** illustrates a teaching apparatus for simulating an execution of a computer program in accordance with the disclosed embodiment. The teaching apparatus comprises of a plurality of function blocks **200, 300, 400, 500** and each function block **200, 300, 400, 500** has a receptacle **201** extending therethrough that when combined with a corresponding function block **200, 300, 400, 500**, the receptacles **201** form a track that may simulate an execution of the computer program, where a start of the track may represent an input and an end of the track may represent an output of the computer program. Preferably, the plurality of function blocks **200, 300, 400, 500** may be made of a plastic-type material or any suitable non-toxic material that is safe for use with children. In a preferred embodiment, the function blocks **200, 300, 400, 500** may include one or more terminal blocks **200**, one or more flowline blocks **300**, one or more process blocks **400**, and one or more decision blocks **500**, in which each function block **200, 300, 400, 500** may be horizontally connected to each other in a side-by-side connection. Each of the function blocks **200, 300, 400, 500** are configured with different shapes and sizes which depict their individual function for ease of identification by a user, all of which will be discussed further herein.

As illustrated in **FIG. 1**, the teaching apparatus further comprises a mobile unit **100** that is configured to navigate along the track of the combined function blocks **200, 300, 400,**

**500**. The mobile unit **100** may be mechanically actuated via a wound-up clockwork spring, or battery-operated, in which the mobile unit **100** may be remotely actuated through a mobile device or an external control device such as a remote control. By way of example, the mobile unit **100** may be a toy car having a body **101** and wheels **102** that are actuated by a crank **104** that winds up the clockwork spring within said body **101** of the mobile unit **100**. As shown in **FIG. 2**, the mobile unit **100** includes an anchor **103** that is configured in a shape of an elongated member **103a** with a spherical termination **103b**, in which the anchor **103** may be extending from a bottom portion of the mobile unit **100**. In this embodiment, the shape of the anchor **100** corresponds to the shape of the receptacles **201** on each function block **200, 300, 400, 500**, whereby the receptacles **201** are rectangular in shape with a circular termination. This configuration secures the mobile unit **100** in place while it navigates along the track and a weight of the anchor **103** prevents the mobile unit **100** from being dislodged from the receptacles **201** until the mobile unit **100** reaches the end of the track.

In come embodiments, as illustrated in **FIG. 3**, the function blocks **200, 300, 400, 500** comprise of one or more terminal blocks **200**, which are each configured to indicate a start and an end of the simulated execution of the computer program. The terminal blocks **200** may be rounded rectangular in shape and is placed at each end of the combination of function blocks **200, 300, 400, 500**. The vehicle unit **100** may be disposed on a first terminal block **200**, which is the starting terminal block, with the anchor **103** fitting into the receptacle **201** of said starting terminal block **200**, such as illustrated in **FIG. 4**. Preferably, the terminal block **200** may then be attached to either a flowline block **300** or a process block **400** thereafter, depending on an execution type of the computer program being simulated.

In an aspect of the present invention, an exemplary embodiment of the one or more flowline blocks **300** and process blocks **400** is illustrated in **FIG. 5**. In this embodiment, the flowline blocks **300** are configured with arrowed indicators that indicate a direction

of execution of the simulated computer program. Preferably, the flowline blocks **300** may be straight rectangular **300a** in shape, or bent **300b** to connect to the process blocks **400**. For example, the flowline blocks **300** may be bent **300b** at 45° or 90° angles and may then be connected to straight rectangular **300a** flowline blocks **300** therewith. This configuration represents a process flow from one process in the computer program execution to another process. As many flowline blocks **300** and process blocks **400** may be connected to each other to form a desired process flow of steps for executing the simulated computer program.

Further illustrated in **FIG. 5** is the process blocks 400 that is configured for providing an audio notification in response to the vehicle unit **100** navigating through said process blocks **400**, wherein the audio notification indicates a successful execution of the simulated computer program. The process blocks **400** are configured with a rectangular shape, similarly with the terminal blocks **200**. By way of example but not limited to, the process blocks **400** may be equipped with a bell **401** having a mechanical means [not shown] that protrudes into the receptacle **201**, such that the bell **401** may then be actuated by the mechanical means as the mobile unit **100** navigates through the receptacle **201** of the process block **400**, causing the bell **401** to ring to simulate the process being executed successfully. Alternatively, sensors may also be incorporated into the receptacles **201** that may be configured for detecting a presence of the anchor **103** passing through it, causing the bell **401** to be actuated upon detection.

**FIG. 6** illustrates exemplary embodiments of the decision blocks **500**, whereby said decision blocks **500** may be hexagonal in shape and are configured with assigned recessed **501a, 501b** to receive one or more parameter blocks **600**, as illustrated in **FIG. 7**. In this embodiment, the decision blocks **500** are configured to achieve different logic operations such as, by way of example, but is not limited to, an “AND” operation, an “OR” operation, and a “NOT” function. Referring to **FIG. 6**, the decision block **500** with the “AND” and “OR” operations have two recesses **501a, 501b** each, both being

shaped according to the shape of the parameter blocks **600**, which will be discussed further herein. Preferably, the decision blocks **500** have receptacles **201** that may be forked into separate independent receptacles **600** according to the different logic operations mentioned above, and may be equipped with one or more movable obstructions **502**in each receptacle **201**, such that the movable obstructions **502** are actuatable to allow passage of the mobile unit **100** in response to the receipt of the parameter blocks **600**. By way of example, the movable obstructions **502** may be baffles or barriers that extend across the receptacles **201** and are retractable upon receiving correct parameter blocks **600** in the assigned recesses **501a, 501b**.

In a preferred embodiment as illustrated in **FIG. 8**, the parameter blocks **600** may be representative of binary functions that indicate a True statement and a False statement, as illustrated by a "T" and an "F" embossed on either side of the assigned recesses **501a, 501b** of the decision blocks **500** and on one end of the parameter blocks **600**. The end of the parameter blocks **600** as mentioned is equipped with a toggleable switch **601** that alternates between settings for the True statement and the False statement. Preferably, the parameter blocks **600** may be prism shaped, but any shape may be utilized for the parameter blocks **600**, which in turn, will be reflected on the shape of the assigned recesses **501a, 501b** on the decision blocks **500** as well. Additionally, the parameter blocks **600** may be configured with different colours for easy identification based on predetermined instructions for executing the simulated computer program that is provided to the user. For example, a green trapezoidal parameter block **600** may be True "AND" a red triangular parameter block **600** may be False; a yellow circular parameter block **600** may be True "OR" a blue rectangular parameter block **600** may be False; and a purple oval parameter block **600** may be False, or the likes.

In an aspect of the present invention as illustrated in **FIG. 7A-7C**, operations of the movable obstructions **502** are based on whether the parameter blocks **600** are inserted correctly into the assigned recesses **501a, 501b** on the decision blocks **500**. By way of

example, the decision block **500** with the "AND" operation requires both assigned recesses **501a, 501b** to receive the parameter blocks **600** having the correct shapes and switches **601** set to the correct setting corresponding to indicated statement. For this operation, each receptacle **201** on the decision block **500** may have one movable obstruction **502**. Upon inserting the parameter block **600** correctly into the assigned recess **501a, 501b**, the movable obstruction **502** may than be retracted to allow passage of the mobile unit **100** thereafter. For the decision block **500** with the "OR" operation, said decision block **500** may have two assigned recesses **501a, 501b** like the "AND" operation, but the parameter block **600** may be inserted into only either one of the assigned recesses **501a, 501b** to retract the movable obstruction **502** thereafter. In another embodiment, the decision block **500** having the "NOT" operation may only have one assigned recess **501a**, in which the movable obstructions **502** are retracted once the parameter block **600** with the correct setting is inserted correctly.

For all the operations above, once the parameter blocks **600** with the correct settings have been correctly inserted into the assigned recesses **501a, 501b** of the decision blocks **500**, the movable obstructions **502** may be retracted and allow the mobile unit **100** to navigate through the receptacles **201** until the simulation of the execution of the computer program is completed. In an aspect of the present invention, a predetermined combination of function blocks **200, 300, 400, 500** representing the completed process flow of the simulated computer program may be prepared beforehand and only requires the user to input the parameter blocks **600** correctly into the assigned recesses **501a, 501b** of the decision blocks **500**. However, for more complex operations or for higher difficulties of execution, the combination of function blocks **200, 300, 400, 500** may not include the decision blocks **500**, and certain parameter blocks **600** may be provided. As such, the user may then be required to choose the most suitable decision blocks **500** and insert the parameter blocks **600** with the correctly into said decision blocks **500** to complete the process flow with said combination of function blocks **200, 300, 400, 500**.

The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularly, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.

**CLAIMS**

1. A teaching apparatus for simulating an execution of a computer program, the apparatus comprising:
a plurality of function blocks (200, 300, 400, 500), each of the function block (200, 300, 400, 500) having a receptacle (201) extending therethrough that when combined with a corresponding function block (200, 300, 400, 500), the receptacles (201) form a track that simulates an execution of the computer program; and
a mobile unit (100) configured to navigate along the track of the combined function blocks (200, 300, 400, 500);
wherein the function blocks (200, 300, 400, 500) include one or more decision blocks (500) which are each configured with assigned recesses (501a, 501b) to receive one or more parameter blocks (600), such that the decision blocks (500) are equipped with movable obstructions in the receptacles (201) that are actuatable to allow passage of the mobile unit (100) in response to the receipt of the parameter blocks (600) with an appropriate setting as dictated on the parameter blocks (600).

2. The teaching apparatus according to claim 1, wherein the function blocks (200, 300, 400, 500) further include one or more terminal blocks (200), one or more flowline blocks (300), and one or more process blocks (400).

3. The teaching apparatus according to claim 2, wherein the terminal blocks (200) indicate a start and an end of the simulated computer program.

4. The teaching apparatus according to claim 2, wherein the flowline blocks (300) are configured with arrowed indicators that indicate a direction of execution of the simulated computer program.

5. The teaching apparatus according to claim 2, wherein the process blocks (400) are

configured for providing an audio notification in response to the mobile unit (100) navigating through said process blocks (400), in which the audio notification indicates a successful execution of the simulated computer program.

6. The teaching apparatus according to any one of the preceding claims, wherein the receptacles (201) are rectangular or oval in shape with a circular termination.

7. The teaching apparatus according to any one of the preceding claims, wherein the mobile unit (100) comprises of an anchor (103) configured in a shape of an elongated member (103a) with a spherical termination (103b), with the anchor (103) beings fixed to a bottom portion of the mobile unit (100).

8. The teaching apparatus according to any one of the preceding claims, wherein the mobile unit (100) is either mechanically-powered or battery-powered.

9. The teaching apparatus according to the preceding claims, wherein the parameter blocks (600) with a switch (601) between two states represent binary functions that indicate a True statement and a False statement respective of the simulated computer program.

10. The teaching apparatus according to claim 9, wherein the receptacle (201) on the decision block (500) is forked into independent opposing receptacles (201), each one representing the True statement and the False statement of the binary function respectively.

11. The teaching apparatus according to claims 9 or 10, wherein the movable obstructions are actuated upon inserting the parameter blocks (600) correctly into the assigned recesses (501a, 501b) on the decision blocks (500) according to True statement or False statement as dictated by the simulated computer program.