

Description

Title of Invention: AUTOMATED TOOL TO ASSESS CHILD DEVELOPMENT

Technical Field

[0001] The present invention relates generally to a tool to assess child development, more particularly a tool to assess child's language, cognitive and fine motor skills.

Background Art

[0002] A teacher, specialist and paediatrician would need to spend some time with a child to assess the development, especially language, cognitive and fine motor skills of the child. Each children have different level of development for these respective areas. It takes some time for a teacher, specialist and paediatrician to assess a group of students. Each child would need to be assessed individually.

[0003] Tests and questionnaires are developed to test specific skill set. Children are prompted to answer questions. A teacher, specialist and paediatrician would need to spend some time to evaluate the result of such tests or questionnaires.

[0004] Digital device or test are being developed to reach more children. US5,122,952A disclosed an automated learning tool for child development. Products such as toys, games, and books are analyzed and the data relating to the personal traits required to use the product is entered into a computer system. Information concerning a child's sensory learning preferences, hobbies and interests, academic conditions, medical conditions, social habits, emotional attitudes and nutritional habits is entered into the computer system. The system matches the child data with the product data which parents can select appropriate learning tools for the child.

[0005] US10,347,148B2 describes a system for adapting lessons to student needs. The system generates data for each student, the data pertaining to a student's interaction with an educational system, analyzes the data to identify clusters according to a mathematical model, and adapts the educational system to provide customized learning experience to a particular student based on the identified cluster.

[0006] US11,183,075B2 discloses an automated assessment of cognitive, fine-motor and memory skills. The automated assessment involves the use of sensors integrated in geometric blocks. The blocks are monitored real-time during each interactive sessions including block accelerations, time at stages of assembly completion, time completion of quizzes and correctness of assembly steps.

[0007] There is various assessment tool. It is desirable to devise a tool to assess child development using existing phone capabilities. It is an object of the invention to assess child development with a phone's multiple features.

Summary of Invention

- [0008] A new computer-implemented tool to assess child development is described. The tool involves a system having an assessor device including a microprocessor configured to include a graphical user interface. The assessor device is a smart device having a camera, a microphone and a touch-enabled screen.
- [0009] A platform is used to hold the assessor in a steady position for child operation. An activity pad has boundaries for activities to be performed. The boundaries are adapted to be within the view of the camera.
- [0010] The child is presented with a series of assessment exercises via the touch-enabled screen. The assessment exercises are to be performed within the boundaries of the activity pad. Video recordings of the assessment exercises performed are captured. Assessment exercises are not limited to drawing activity, block building, speech prompts, listening and identifying objects.
- [0011] Images of the video recordings are processed to identify performance characteristics of the child. The performance characteristics is based on a distribution of data set of children's fine motor skills, language skills and cognitive skills.

Brief Description of Drawings

- [0012] The invention will now be described in greater detail, by way of an example, with reference to the accompanying drawings, in which:

Fig. 1

- [0013] [Fig.1] illustrates a diagram of an assessor and a platform, according to the invention.

Fig. 2

- [0014] [Fig.2] illustrates a diagram of the assessor and an activity pad.

Fig. 3A-3B

- [0015] [Fig.3A][Fig.3B] illustrate diagrams of drawing exercises.

Fig. 4

- [0016] [Fig.4] illustrates a diagram of block stacking exercise.

Fig. 5A-5B

- [0017] [Fig.5A][Fig.5B] illustrate diagrams of speech prompts.

Fig. 6A-6B

- [0018] [Fig.6A][Fig.6B] illustrate diagrams of verbal questions and multiple-choice answers.

Fig. 7A-7B

- [0019] [Fig.7A][Fig.7B] illustrate diagrams of shown object and multiple-choice answers.

Fig. 8A-8B

- [0020] [Fig.8A][Fig.8B] illustrate diagrams of shown objects and multiple-choice answers.

Fig. 9

[0021] [Fig.9] illustrates a diagram of block diagram of the assessor device operation.

Detailed Description of Embodiments

[0022] An illustrative way of how the automated tool is setup and used for assessment is presented. The automated tool is targeted at children age 3 to 5. The assessment tool can be adapted to target other age group or children with learning disabilities.

[0023] The hardware for one embodiment of the tool is first described according to [Fig.1] and [Fig.2]. The heart of the tool lies in an assessor device 10 including a micro-processor configured to include a graphical user interface, said assessor device being a smart device, said smart device having a camera, a microphone and a touch-enabled screen 56.

[0024] The assessor device can be in a form of a mobile device, smartphone, tablet, game console or assembled computer. A smartphone is used as an illustration as it encompasses the hardware needed to perform the assessment.

[0025] A platform 12 holds the assessor device 10 so that the touch-enabled screen 56 is in a steady position for child operation. The assessor device is hold in a vertical position for ease of operation. The platform 12 is adapted to fit a specific assessor device 10. The platform 12 can be designed to look like an animal such as a cat, hence, cat ear design elements are fitted to be child friendly.

[0026] A ramp 14 is attached next to the platform. An activity pad 16 can be unfolded from the ramp 14. The activity pad 16 has boundaries 18 for activities to be performed. The boundaries 18 are adapted to be within the view of the camera.

[0027] Drawing sheets 20, pen 22, and cube blocks 24 are used as part of assessment exercises. Drawing sheets 20 and pen 22 shall be operated by a child within the view of the camera. Twelve cube blocks 24 are also prepared. The use of drawing sheets and cube clocks would be explained later.

[0028] Now, an example of an assessment exercise is described. The first assessment involves drawing on the drawing sheet.

[0029] The child is presented with a series of assessment exercises, particularly drawing exercises. The child is presented with a drawing sheet 20. The assessor device provides an instruction to draw a straight vertical line. The child would then need to use the pen 22 draw a straight vertical line on the drawing sheet 20 on the space provided. Next, the child would be asked to draw a straight horizontal line, proceeded with a circle.

[0030] The assessor can request the child to draw other shapes. [Fig.3A] shows an instruction to draw a square while [Fig.3B] shows an instruction to draw a person as shown. The camera captures video recording of the drawing.

[0031] The second type of assessment involves block stacking exercises. The child would be asked to stack six blocks 24 as shown in [Fig.4]. The blocks 24 are to be stacked on

dotted guides 26 so that the stacking of blocks is within the boundaries of camera view. The camera captures video recording of the stacked blocks 24.

- [0032] The third type of assessment involves speech prompts. For example, the assessor asks the child what is the colour of the balloon, as shown in [Fig.5A]. The child will be prompted to respond. The assessor may also ask 'a man is big a baby is ?', as shown in [Fig.5B]. A video recording is made to capture the verbal respond.
- [0033] The fourth type of assessment involves verbal questions and multiple-choice answers. The assessor may ask the child to identify a cat while showing four multiple choice answers 28 on the touch-enabled screen involving a car, a ball, a pencil and a cat, as shown in [Fig.6A]. The assessor may also ask the child to identify letter 'z' while showing four multiple choice answers 28 involving a letter i, letter g, letter p, letter z and letter a, as shown in [Fig.6B]. The choice of the child's touch is recorded.
- [0034] The fifth type of assessment involves showing and matching objects 30. The assessor may ask the child to match a shown object with multiple choice answers 28. The child can be shown a circle, as shown in [Fig.7A], and asked to identify the circle among three multiple choices of objects. Then, the child can be shown a star symbol (*), as shown in [Fig.7B] and asked to identify the star among four multiple choices of objects.
- [0035] The sixth type of assessment involves memorization. The assessor may ask the child to look at three objects 30 namely a cat, an apple and a teddy bear, as shown in [Fig.8A]. Then, there would be eight objects as multiple-choice answers 28 shown on the screen. The assessor will ask the child to point out the three earlier shown objects 30. Another type of memorization is shown in [Fig.8B], where five objects 30 namely a cat, an apple, a chair, a cat and a cup are shown. The child would be asked to memorize the object and its position. Then, the objects are flipped to hide the objects as multiple-choice answers 28. The child would be asked to identify an object, say a cat.
- [0036] The operation and scoring of the assessment exercises are described according to [Fig.9].
- [0037] The first assessment involves drawing sheet and the drawing 32 is captured by camera 34 in the form of video recording 36. Images of the drawing are processed via artificial intelligence 38. A performance characteristic that represents fine motor skill of the child is determined based on a distribution of data set of children's fine motor skills 40. How the pen is held may also be analyzed.
- [0038] The second assessment involves block stacking and the stacked blocks 24 is captured by camera 34 in the form of video recording 42. Images of the stacked blocks are processed via artificial intelligence 44. A performance characteristic that represents fine motor skill of the child is determined based on a distribution of data set of

children's fine motor skills 40. How the blocks are stacked, ie one at a time or two at a time is also evaluated.

- [0039] The third assessment involves speech prompt and the speech is captured by camera 34 and microphone 46 in the form of video recording 48. Audio of the speech are processed via artificial intelligence 50. A performance characteristic that represents language skill of the child is determined based on a distribution of data set of children's language skills 52.
- [0040] The fourth assessment involves listening and identifying involving multiple choice answers 54 on the touch-enabled screen 56. Touch choice are processed via artificial intelligence. A performance characteristic that represents language skill of the child is determined based on a distribution of data set of children's language skills 52.
- [0041] The fifth assessment involves seeing and matching involving multiple choice answers 58 on the touch-enabled screen 56. Touch choice are processed via artificial intelligence. A performance characteristic that represents cognitive skill of the child is determined based on a distribution of data set of children's cognitive skills 60.
- [0042] The sixth assessment involves memorizing and identifying involving multiple choice answers 62 on the touch-enabled screen 56. Touch choice are processed via artificial intelligence. A performance characteristic that represents cognitive skill of the child is determined based on a distribution of data set of children's cognitive skills 60.
- [0043] The distribution of data set of children's fine motor skills, language skills and cognitive score were collected in a survey involving drawing, block stacking, vocabulary, speech, visual and memorization routes. The data is obtained from surveys involving a large data set of children. A person skilled in the art can adapt other skills to be part of the assessment.
- [0044] The processing of images and audio involves analyzing eye contact, concentration level, emotion, posture, and voice quality. Time involved in completing each task also evaluated.
- [0045] The tool can recognize development strengths and suggest personalized learning content to improve the learning experience of children. It can also identify development concerns and suggest areas for further evaluation if intervention is needed. The tool can address the gap of assessment accessibility and affordability in developing countries.
- [0046] Accordingly, the invention discloses a tool to assess child development. Although the descriptions above contain much specificity, these should not be construed as limiting the scope of the embodiment but as merely providing illustrations of some of the presently preferred embodiments.

Claims

[Claim 1] A method of operating a computer-implemented apparatus for assessing development of a child,

5 wherein:

 a system having an assessor device including a microprocessor configured to include a graphical user interface, said assessor device being a smart device, said smart device having a camera, a microphone and a touch-enabled screen;

 a platform to hold the assessor device in a steady position for child operation; and

10 an activity pad physically connected to the platform, said activity pad having boundaries for activities to be performed, said boundaries being adapted to be within the view of the camera
 are prepared,

the method comprising:

15 presenting the child with a series of assessment exercises via the touch-enabled screen, said assessment exercises being to be performed within the boundaries of the activity pad;

 adapting the camera to capture video recordings of the assessment exercises performed on the activity pad; and

20 processing images of the video recordings using artificial intelligence to identify performance characteristics that represent fine motor skills of the child, said performance characteristics being based on a distribution of data set of children's fine motor skills.

25 [Claim 2] The method according to claim 1, wherein the step of presenting the child with a series of assessment exercises is conducted with a series of drawing exercises, and the images of the drawings are being processed to determine fine motor skills of the child.

30 [Claim 3] The method according to claim 1, wherein the step of presenting the child with a series of assessment exercises is conducted with a series of block stacking exercises, and the images of the stacked blocks are being processed to determine fine motor skills of the child.

[Claim 4] The method according to claim 1, further comprising presenting the child with a series of assessment exercises involving speech prompts, capturing the video recordings of the child responding to the speech prompts, processing audio of the video recordings of the child responding to the speech prompts using artificial intelligence, said processing of audio being
5 to identify performance characteristics that represent language skills of the child, said performance characteristics being based on a distribution of data set of children's language skills.

[Claim 5] The method according to claim 1, further comprising presenting the child with a
10 series of assessment exercises involving verbal questions and multiple choice answers on the touch-enabled screen, capturing the touch choices of the child on the touch-enabled screen, processing the touch choices of the child responding to the verbal questions using artificial intelligence, said processing of the touch choices being to identify performance characteristics that represent language skills of the child, said performance characteristics being based on a
15 distribution of data set of children's language skills.

[Claim 6] The method according to claim 1, further comprising presenting the child with a series of assessment exercises involving a shown object and multiple choice answers on the touch-enabled screen, capturing the touch choice of the child on the touch-enabled screen,
20 processing the touch choice of the child responding to the object shown using artificial intelligence, said processing of touch choice being to identify performance characteristics that represent cognitive skills of the child, said performance characteristics being based on a distribution of data set of children's cognitive skills.

[Claim 7] A computer system for assessing development of a child, comprising:

an assessor device that is a smart device, said smart device including a microprocessor configured to include a graphical user interface, a camera, a microphone and a touch-enabled screen;

5 a platform, said platform being adapted to hold the assessor device in a steady position for child operation;

an activity pad physically connected to the platform, said activity pad having boundaries for activities to be performed, said boundaries being adapted to be within the view of the camera; and

10 a non-transitory computer readable media that collectively store instructions that cause the computer system to perform operations,

when the instructions are executed by the microprocessor, the operation comprising:

15 presenting the child with a series of assessment exercises via the touch-enabled screen;

obtaining from the camera captured video recordings of the assessment exercises on the activity pad; and

20 processing images of the video recordings using artificial intelligence to identify performance characteristics that represent fine motor skills of the child, said performance characteristics being based on a distribution of data set of children's fine motor skills.

[Claim 8] The computer system according to claim 7, wherein the operation of presenting the child with a series of assessment exercises is conducted with a series of drawing exercises, and

25 the images of the drawings are being processed to determine fine motor skills of the child.

[Claim 9] The computer system according to claim 7, wherein the operation of presenting the child with a series of assessment exercises is conducted with a series of block stacking exercises, and the images of the stacked blocks are being processed to determine fine motor skills of the

30 child.

[Claim 10] The computer system according to claim 7, wherein the operation of presenting the child with a series of assessment exercises further involves speech prompts, capturing the video recordings of the child responding to the speech prompts, processing audio of the video recordings of the child responding to the speech prompts using artificial intelligence, said
5 processing of audio being to identify performance characteristics that represent language skills of the child, said performance characteristics being based on a distribution of data set of children's language skills.