

A VOICE-CONTROLLED EASEL

TECHNICAL FIELD

[001] This invention relates to an easel for painting that can be manipulated
5 by way of voice commands, in particular to allow a person unable to physically
move a canvas to do so. The voice commands are refined as more
commands are provided and the system learns how to better recognize the
commands and execute them.

BACKGROUND

10 [002] There are many disabilities that a person can have, and one of the
most debilitating is cerebral palsy, as it causes impaired movement and a
reduced range of motion. While there are technologies that may aid in
improving the quality of life, there are few relating to art.

[003] Existing assistive technologies related to enabling of artist painting
15 with physical impairments, use a voice recognition system to control a digital
canvas. A computer with a display that becomes a digital canvas is a digital
only solution where the painting art piece is a software art piece displayed on
a computer monitor and all drawing functions (such as colour palette, paint
brush type and its painting stroke) to draw the digital art-piece are also limited
20 to digital format only. However, this approach does not provide painter the
real experience of drawing on a physical drawing canvas and using the real
acrylic painting material.

[004] In order for a painter who is disabled to paint using their mouth,
assistance is required in terms of moving the canvas due to limited range of

movements, as well as mixing the paints, especially for acrylic painting material.

[005] Hence, there is a need for a paint system that would enable a mouth painter to paint on a physical drawing canvas, with access to colour painting material.

BRIEF SUMMARY

[006] The above and other problems are solved and an improvement in the art is made by a voice controlled easel in accordance with this invention. A first advantage of the voice controlled easel in accordance with this invention is that it enables a mouth painter to have access to all parts of a canvas being painted using voice control. This would enable the mouth painter to be independent and have the freedom to express themselves artistically. A second advantage of the voice controlled easel in accordance with this invention is that it does not require any additional training. The voice commands provided are intuitive to the user and through several iterations; the system would be more accurate as it learns in the process. A third advantage of the voice controlled easel in accordance with this invention is that the voice controlled preparation and mixing of the paints allows the user to have the paint mixing process automated. Aside from requiring less supervision, it also allows for the colours to be customized and precisely mixed.

[007] The voice controlled easel system allows users who have severe motor deficiency in their limbs to use voice commands to control a paint

canvas and to have colour material dispensed on a palette for painting while requiring less assistance from care-givers.

[008] A paint mixing kit for use by a visually impaired user is provided in the following manner in accordance with some embodiments of the invention with
5 a processor capable of processing an input and providing a control command, and a paint dispenser with at least two different colours of paint, where an input is provided to the processor and the processor issues a control command to the paint dispenser to dispense an amount of paint onto a mixing palette.

10 **[009]** In accordance with some embodiments, the mixing palette of the paint mixing kit is rotatable upon a control command from the processor. In other embodiments in accordance with the invention, the input is provided by one of a joystick controller, a button controller, a keyboard, a mouse. In accordance with a number of embodiments of the invention, the input is a
15 voice command. In further embodiments according to the invention, the voice command is processed by a voice command engine within the processor and the voice command engine is trained using a neural network. In yet further embodiments according to the invention, the paint mixing kit also has a motorised easel capable of movement based on a control command from the
20 processor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention is illustrated by way of example with reference to the accompanying drawings which show a voice controlled easel in accordance with the invention. The accompanying drawings, which are incorporated
25 herein and form part of the specification, illustrate various embodiments of the present disclosure and, together with the description, further serve to

explain the principles of the disclosure and to enable a person skilled in the pertinent art to make and use the embodiments disclosed herein. In the drawings, like reference numbers indicate identical or functionally similar elements.

5 **[0011]** Figure 1 is the overview system of a voice controlled easel;

[0012] Figure 2 shows the component system of the voice controlled easel;

[0013] Figure 3 shows sampling and training of the voice recognition module.

DETAILED DESCRIPTION

[0014] The various configurations discussed in these non-limiting examples
10 can be varied and are used to illustrate at least one embodiment and are not intended to limit the scope thereof.

[0015] Referring to the drawings, Figure 1 shows an overview of the system
100 with the various inputs in the form of voice commands from a microphone
with an attached processor 110, joystick controls 120, and button controllers
15 130. These interface with a controller board 140 on the easel 141 itself, where
motor modules, or motors with its motor controllers 142, are shown. The
controller board 140 can include a processor or a device with computational
abilities to receive and issue instructions. These motors 142 control the
horizontal and vertical movement of the canvas 145 mounted on the easel.
20 The controller board 140 can also send a signal to a paint dispenser 152 to
dispense paint as well as to rotate the palette 154, thus enabling a mixing of
the paint.

- [0016]** The voice-controlled motorized easel enables mouth-painters to paint on all areas of a drawing canvas without assistance. The canvas sits on a designed motorized easel/canvas structure. The voice-controlled system allows a mouth-painter to use voice commands like 'Left/Right/Up/Down' to
5 move the canvas to within the reach of a paintbrush being held by the painter. This is in contrast to a traditional approach where an assistant has to help the mouth-painter to move the canvas/easel to a suitable position. This enables the user to express themselves in a physical piece of art, as opposed to a digital drawing.
- [0017]** The voice-controlled motorized paint dispenser enables mouth-painters to dispense paint from a set of different paint colour paint dispenser units and for the color palette to be within their reach. The mouth-painter uses he/her voice commands (e.g. One/Two/Three/Four/Five) to select colour from the dispenser units. The system can also allocate the names of colours
15 instead of numbers and be able to recognize and process the commands accordingly. The colour dispenses on the palette that rotates so that the desired paint is within a reachable zone of the painter, especially when holding the paintbrush with the mouth. The amount of paint dispensed from the dispenser units can also be adjusted by the processor, depending on the
20 input provided. The mouth-painter can use voice commands to determine how much paint should be dispensed, possibly using quantized or preset amounts in the range of 1 to 5 where 1 is dispensing the least amount of paint and 5 is the most. Based on voice commands, other analogue amounts can

also be used, where the paint is dispensed slowly until the desired amount is reached and the processor is given the command to stop.

[0018] Figure 2 is a quick overview of how the various components interact. The User Interface Unit (UIU) 210 may utilize several forms of providing
5 commands to the system. These inputs can control the movement of the canvas on the easel or select the paint to be dispensed and can vary from a joy stick controller, a button controller, a keyboard, a mouse, or any other form of input that can provide movement instructions to the computer or processor or microprocessor. A desired approach is to enable voice commands to be
10 used, and the UIU can include a microphone for receiving voice commands, a GUI software on board a computer for voice commands processing and communication to the Paint Canvas Unit (PCU) and/or the Colour Dispenser Unit (CDU). Voice command, voice detection, and machine learning engines are pre-trained and installed on the computer in an off-line mode, which mean
15 no internet connection is required. Other forms of inputs like tracking of eyeballs coupled with blinking of the eyes to execute commands, or mouthing of words using electroglottographic (EGG) signals, can also be implemented for users with more severe disabilities.

[0019] The PCU consists of a voice-enabled Motor Controller Board
20 controlling the X-, Y- motion of the canvas via activating the respective motors on reception of the commands “Left, Right, Up or Down” via the various inputs.

[0020] The CDU, which uses the same firmware based controller board, controls a motorized rotary palette and 5 units of colour dispenser. On

reception of the commands “One, Two, Three, Four, Five”, the selected paint is dispensed on the palette and the palette rotates so the dispensed paint is positioned at a reachable zone of the user.

[0021] Another component not shown is the motor controller board, which can include of a set of firmware and hardware devices that regulate the functionalities (e.g. starting, motion, stepping) of the motors installed in the PCU and the CDU. The motor controller board can be distinctive to other standard motor controllers as its functionalities are activated by a set of voice commands in firmware instructions, and can reside either on the PCU, the CDU, or even as a separate component.

[0022] Figure 3 shows how the audio signal of the voice of a user is used to train the AI and refine the voice recognition process. The incoming audio signal can be represented over time 301 and as a two dimensional (2D) image 302. The voice command engine was trained using Convolutional Neural Networks (CNN) and a keyword spotting approach. Other approaches such as Deep Neural Networks and sentence based approaches can also be implemented. By training the system to the voice commands of a particular user, the system is able to issue commands to the various controller boards and execute what is required without further inputs.

[0023] Thus, the present invention has been fully described with reference to the drawing figures. Although the invention has been described based upon these preferred embodiments, to those of skill in the art, certain modifications, variations, and alternative constructions would be apparent, while remaining within the spirit and scope of the invention.

CLAIMS

1. A paint mixing kit for use by the visually impaired comprising:
a processor capable of processing an input and providing a control
command;
5 a paint dispenser with at least two different colours of paint;
wherein an input is provided to the processor and the processor issues a
control command to the paint dispenser to dispense an amount of paint onto a
mixing palette.
- 10 2. The paint mixing kit according to claim 1 further comprising the mixing
palette being rotatable upon a control command from the processor.
3. The paint mixing kit according to claim 1 wherein the input is provided by
one of a joystick controller, a button controller, a keyboard, a mouse.
- 15 4. The paint mixing kit according to claim 1 wherein the input is a voice
command.
5. The paint mixing kit according to claim 4, wherein the voice command is
20 processed by a voice command engine within the processor and the voice
command engine is trained using a neural network.
6. The paint mixing kit according to any one of claims 1 to 5, further
comprising a motorised easel capable of movement based on a control command
25 from the processor.