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(56) Documents Cited:
GB 2532613 A **WO 2016/183406 A1**
US 20180173980 A1

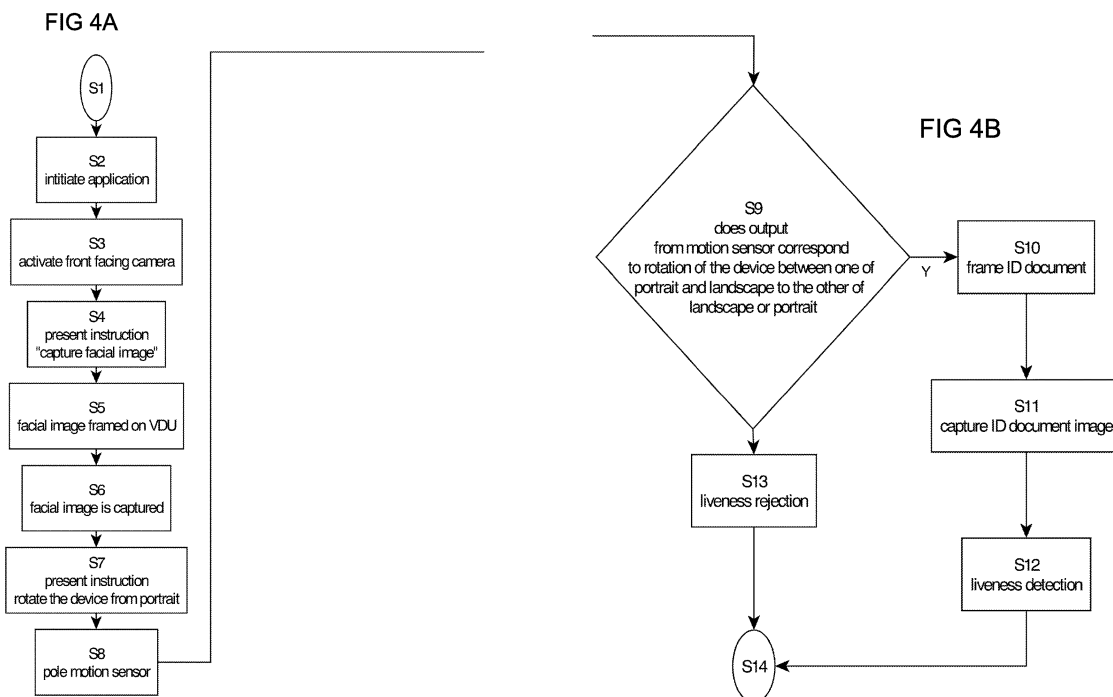
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(58) Field of Search:
 INT CL **A61B, G06F, G06K, H04L**
 Other: **EPODOC, WPI, Patent Fulltext**

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(54) Title of the Invention: **A mobile device liveness detection system**
 Abstract Title: **A mobile device liveness detection system**

(57) Executable code, suitable for use in a mobile computing device, which can detect the liveness of the user by detecting the orientation of the device. The code prompts the user to frame their face (S4), in either portrait or landscape, using a front facing camera in the display of the device (S5), and this image can be captured (S6). The code then prompts the user to rotate their device to the other of portrait or landscape (S7) and frame an identity document using the camera, which can also be captured. The motion sensor of the device is checked (S8) by the code, and if the prescribed change in orientation has occurred the liveness is confirmed, otherwise it is rejected (S9).



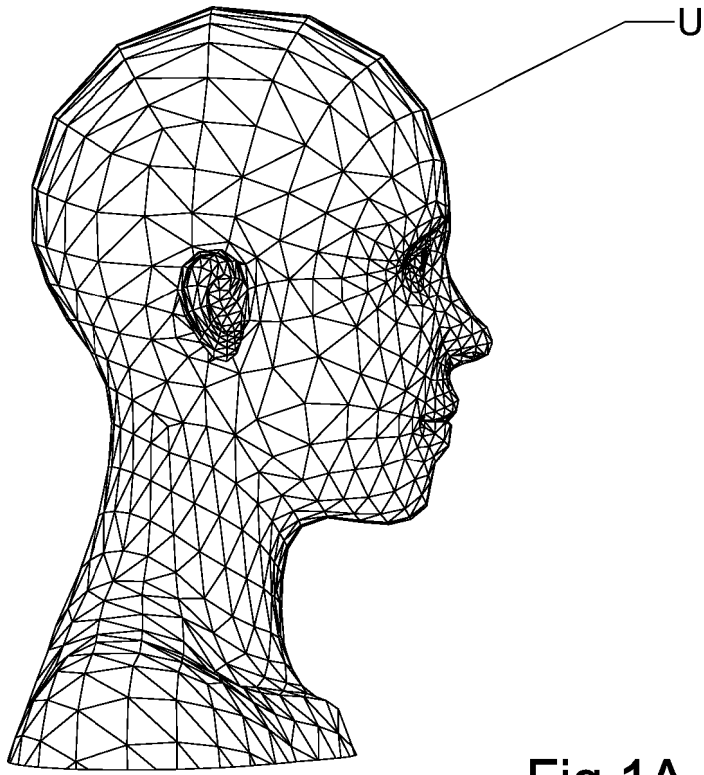


Fig 1A

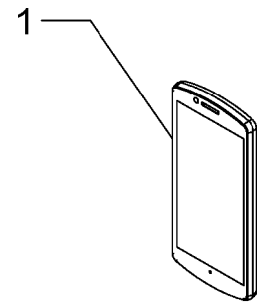
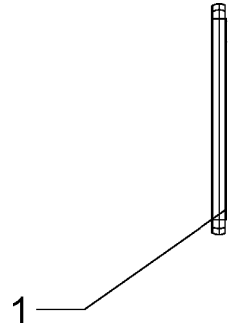
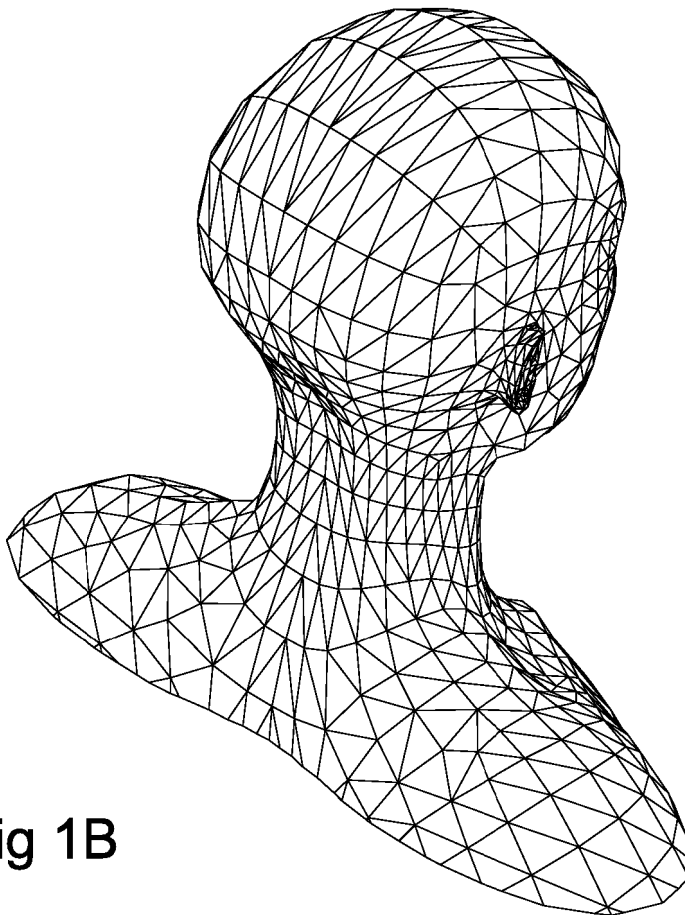


Fig 1B



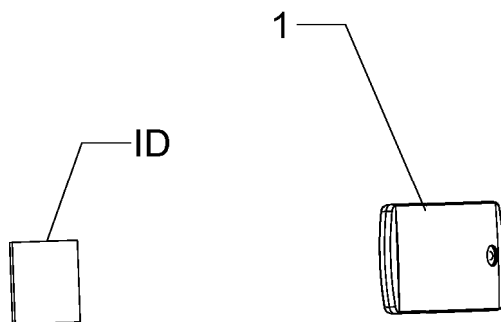
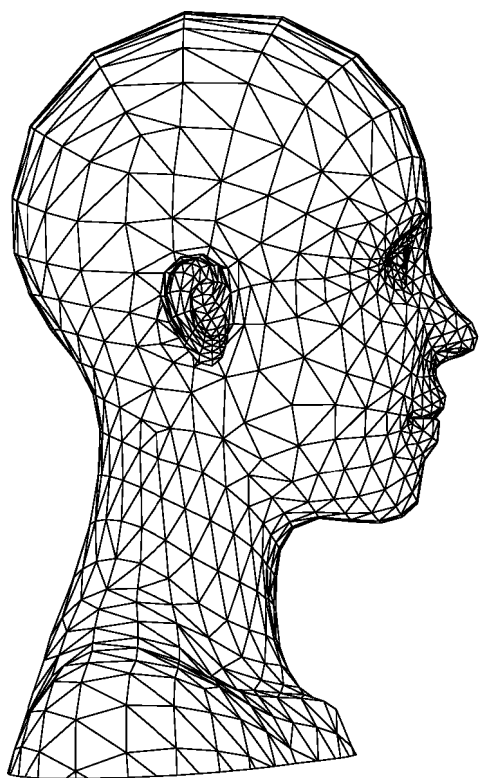


Fig 2A

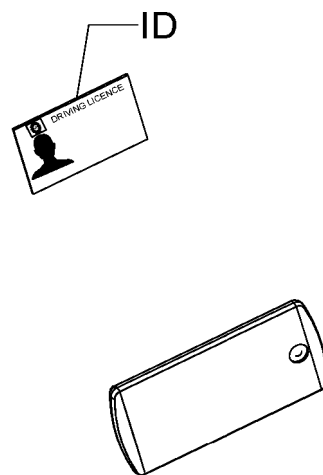
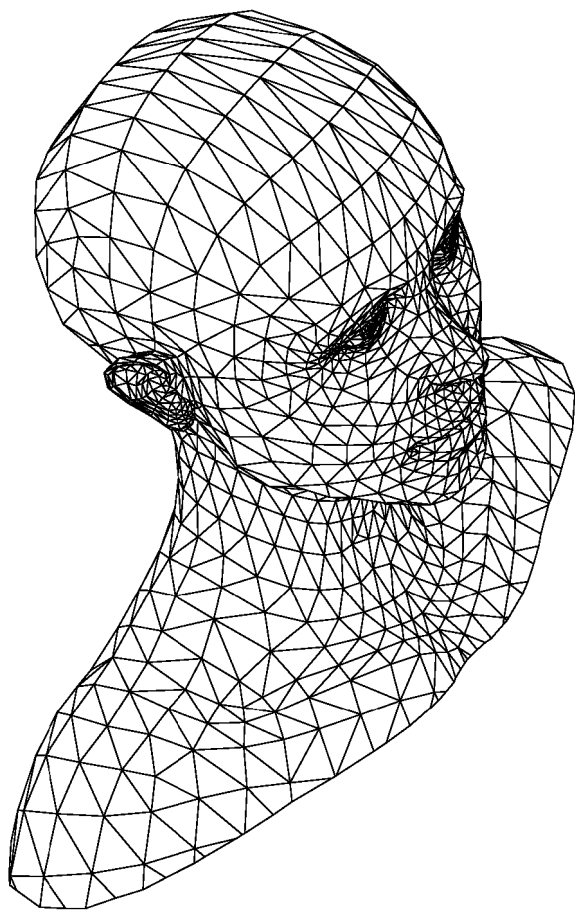


Fig 2B

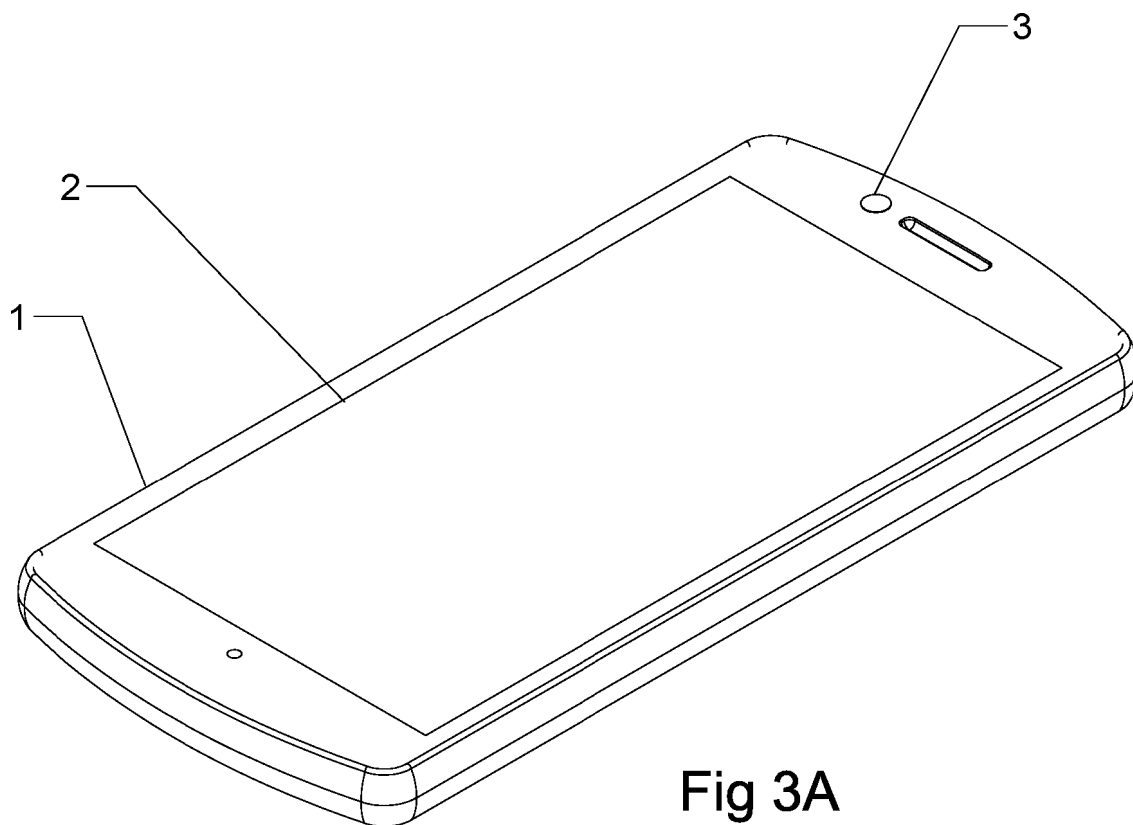


Fig 3A

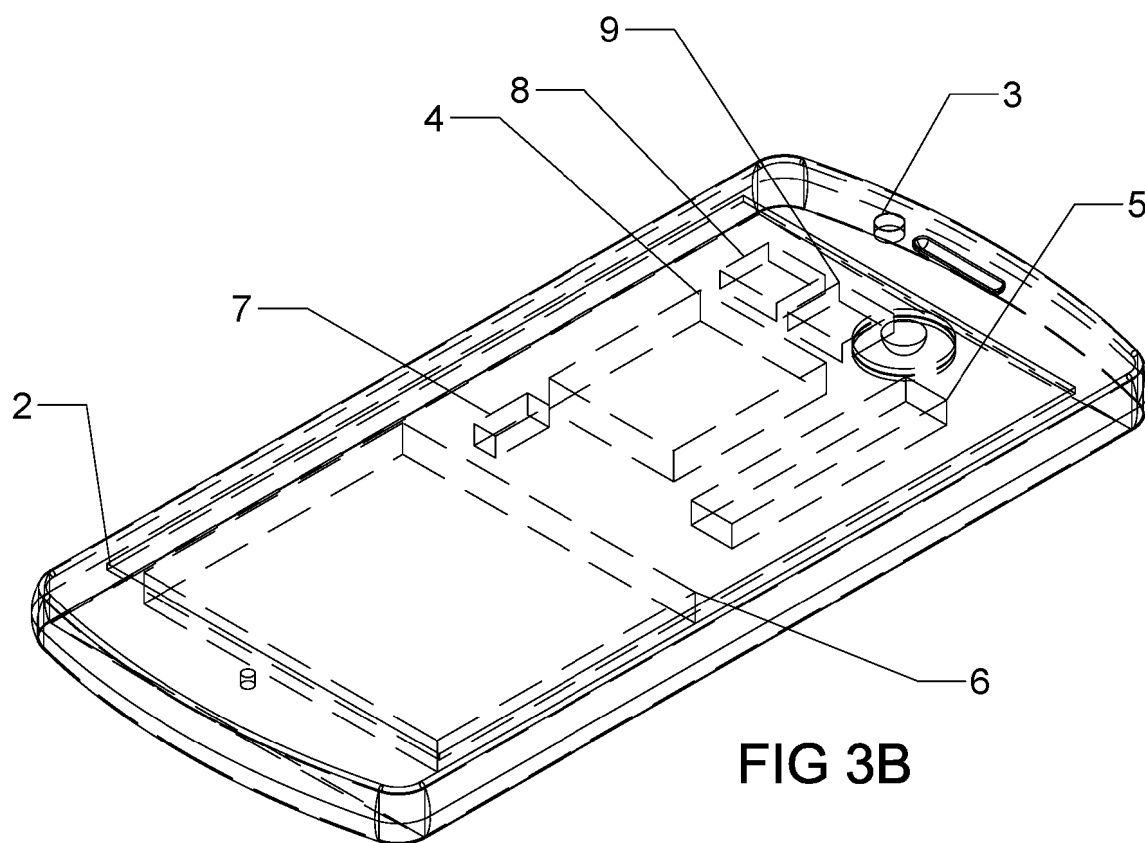


FIG 3B

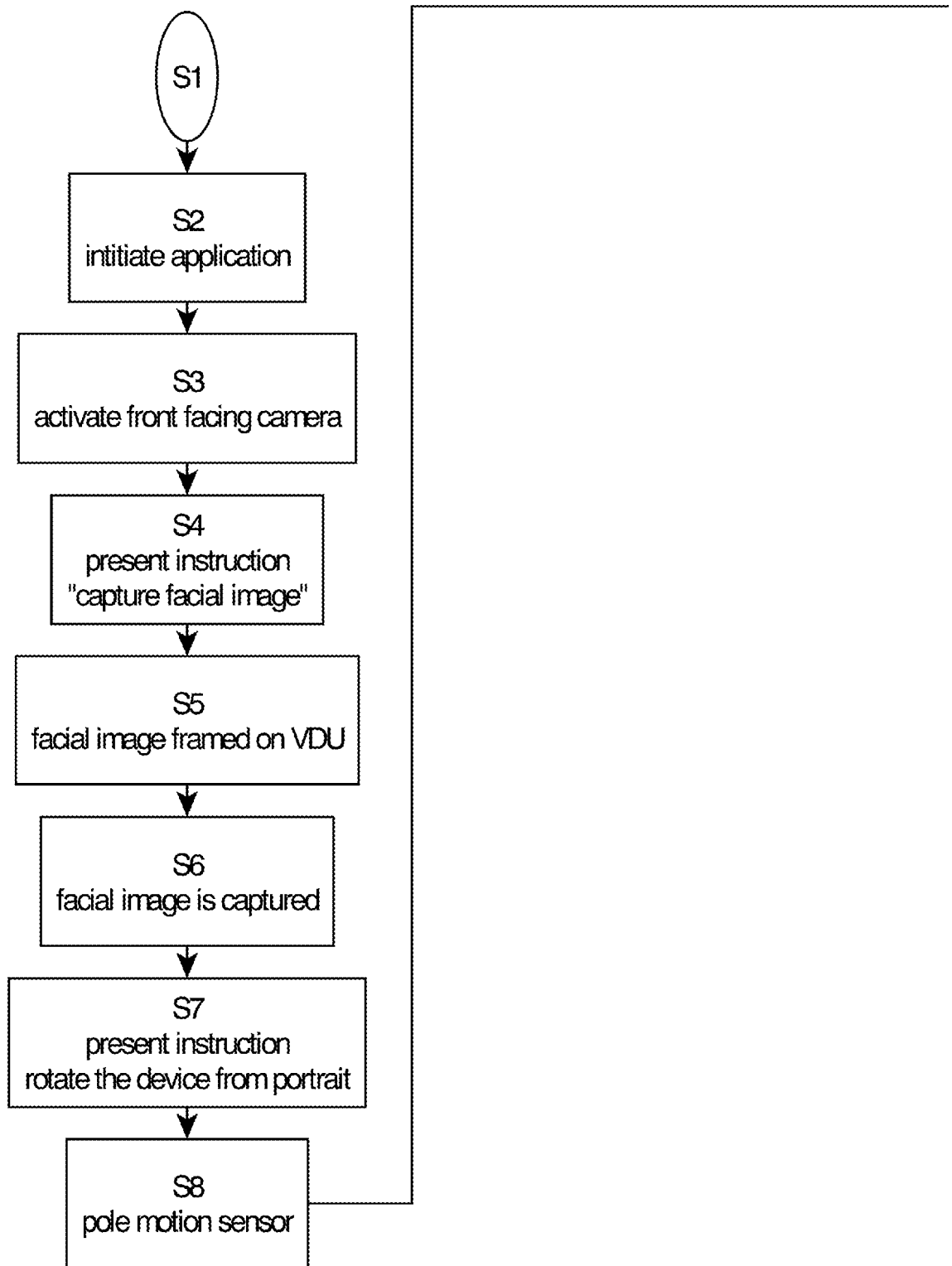


FIG 4A

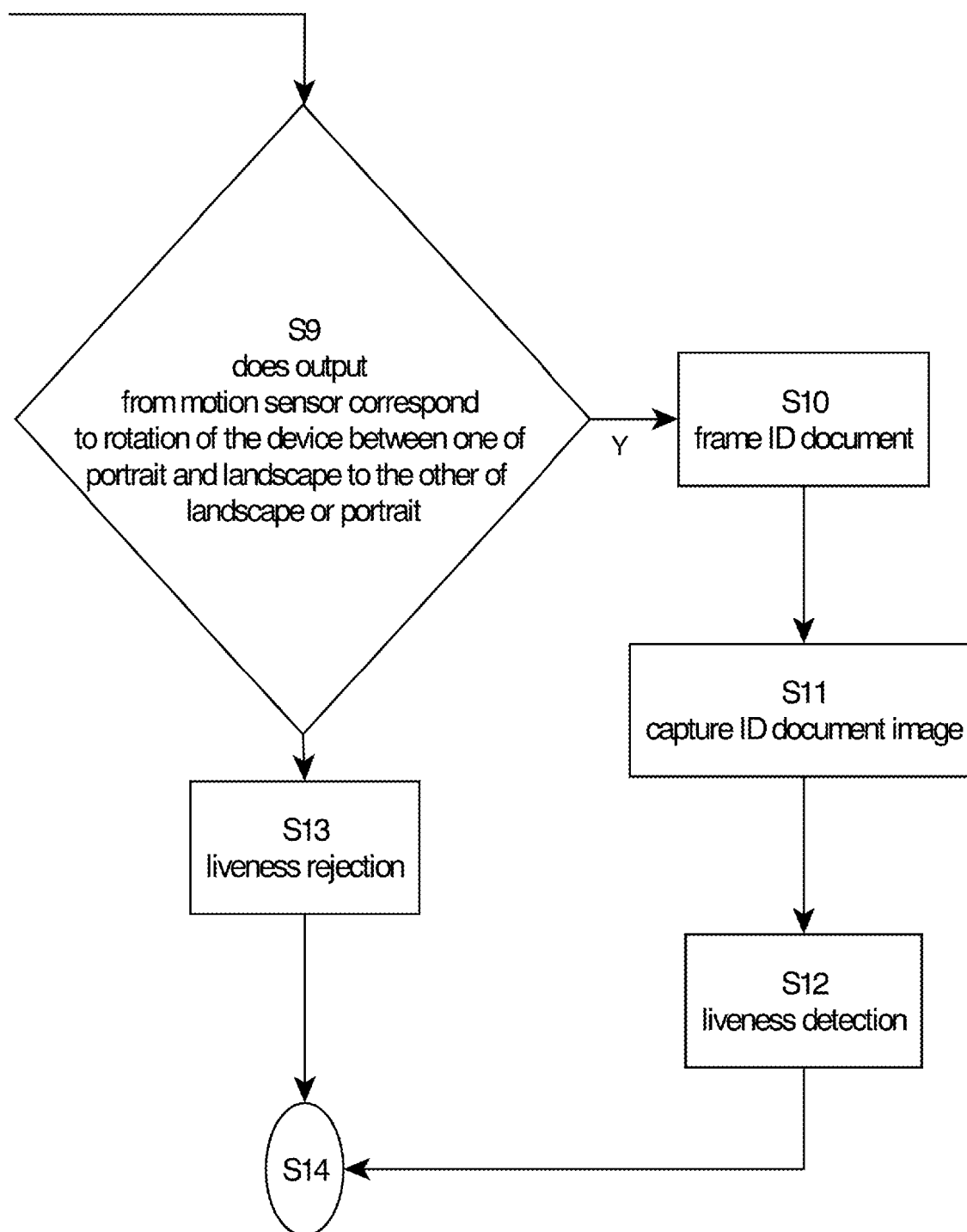


FIG 4B

A mobile device liveness detection system

Technical field

[001] The present invention concerns establishing proof that the user of a mobile device employing an application with face recognition usually for proof of identity is capturing an image of a live face of a user actually present with the device camera.

Background Art

[002] The use of automatic face recognition to identify a user for security purposes is well known and has considerable advantages over conventional password or other biometric systems. However, it is also well known that simple face recognition systems are vulnerable to so called "spoof attacks". Spoofing attacks typically include the: print attack: replay/video attack and the now infamous 3D mask attack. In the print attack simply the attacker uses a photo of the legitimate user. The image is printed or displayed on a digital device. The more sophisticated replay/video attack usually requires a looped video of a victim's face. This approach ensures behaviour and facial movements to look more 'natural' compared to holding someone's photo. In the 3D mask attack a mask is used as the tool of choice for spoofing. In addition to natural facial movements, the 3D mask attack can deceive some extra layers of protection such as 3D stereoscopic cameras.

Statement of invention

[003] A mobile device liveness detection system having;
a processor;
a memory;

a front facing visual display unit and control panel;

at least a front facing camera; and

[004] a motion sensor

said device responsive to a control action to run executable code stored in said memory on said processor;

said processor responsive to said code to switch said front facing camera to an on condition;

said processor acting to present instructions to the user to frame an image of their face in the visual display unit using the front facing camera in a face capture orientation,

said processor responsive to the facial image being framed according to

predetermined parameters to capture the facial image;

said processor responsive to capturing the facial image to present instructions to the

user to move the device and hence the field of view of the front facing camera to a

document capture orientation, different from the face capture orientation, where an

identity document is framed for capture by the front facing camera;

characterised in that the executable code is responsive to the motion sensor sensing

the movement of the device from the face capture orientation to the identity document

orientation to verify liveness detection.

[005] It is important that the face capture and the document capture are achieved by the

same camera, preferably the front facing camera. It is envisioned that the face capture

orientation will be one of portrait or landscape while the document capture orientation

is the other of landscape or portrait mode.

[006] The invention also encompasses a package of machine readable code stored in memory for communication to a device having: a processor; a memory; a front facing visual display unit and control panel; at least a front facing camera; and a motion sensor, for installation in said device in executable form to implement the mobile device liveness detection system.

Brief description of drawings

[007] An embodiment a mobile device liveness detection system in accordance with the present invention will now be described, by way of example only, with reference to the accompanying figures, wherein:

Figure 1A is a side elevation of a user and mobile phone device capturing a face image;

Figure 1B is a NW isometric view of the user and device in figure 1A;

Figure 2A is a side elevation of a user and the mobile device capturing an identification document;

Figure 2B is an isometric NW view of the activity in figure 2A;

Figure 3A is a SE isometric view of the device;

Figure 3B is a SE isometric view of the device showing internal features;

Figure 4A is a first page of a flow chart illustrating steps implemented by the device;

Figure 4B is a second page of the flow chart illustrating steps implemented by the process.

Detailed description of drawings

[008] The figures illustrate a user “U” and a device 1 provided in this case by a smart phone having a touch screen visual display unit 2 capable of displaying images and instructions and receiving input commands from the user “U”. The reader should assume the device 1 is handheld by the user “U”. As is conventional the device 1 has a forward facing camera 3, a central processor 4 capable of processing executable code, memory 5 capable of storing executable code, a power supply 6 in the form of a chemical battery, a motion sensor 7, wireless communication module 8 and wired communication module 9. Wireless communication module 8 enables wireless communication of data via any one or more of 3G, 4G, 5G, WiFi®, Bluetooth® NFC or any other wireless communication protocol the device may be adapted to implement. The wired communication module 9 enables wired communication of data via any appropriate data cable port, most commonly USB. The layout and integration of the aforementioned components will vary from device to device and will also include wired and wireless communication modules.

[009] For various purposes a user may be required to confirm their identity using face recognition and one or more identity documents “ID” such as a driving licence or utility bill. Conventionally this requires the user to present themselves in person at a physical address together with one or more of a selection of physical documents. The present invention seeks to alleviate the need to be physically present while simultaneously ensuring that the user is actually live and in possession of the relevant documents. To this end the user may download a package of executable code enabling the invention

to be implemented on the device 1. The executable code package is downloaded from a source/server on the web using either the wired communications module connected to a web gateway or more commonly via the wireless communications module. The code package is stored on the device memory and an installer run to install the executable code in executable form on the device memory.

[010] When installed on the device the code implements the algorithm shown in figure 4A/4B. At need the user initiates the system on the device at S2. At S3 the system activates the front facing camera 3. At S4 the device instructs the user to manipulate the device to a face capture orientation in order to capture an image of the user's face, ie to take a selfie. As shown face capture orientation is a portrait orientation with the long axis of the device upright. However, a landscape orientation with the long axis of the device substantially horizontal will also serve.

[011] At step 5 the user frames a facial image in accordance with the system requirements. This may require the projection of a frame on the screen in which the facial image is contained.

[012] At step 6 the facial image is captured. This may be by means of the user manually actuating a shutter or in the case of some devices the device may have sufficient embedded intelligence to recognise a facial portrait image and actuate the shutter to capture the image. With the image captured the device processes to step 7 presenting instructions on screen to rotate the device 1 from the initial face capture orientation to an identification document capture orientation which in this example is a landscape orientation. At step 8 the device system poles the motion sensor 7 in order to read the

motion sensor output from the moment the instruction at 7 is presented. At step 9 the output from the motion sensor is compared to expected motion parameters to confirm that the device has been moved as instructed from the portrait face capture orientation to the landscape document capture orientation.

[013] At step 10 the user frames the ID document, for example a user photo ID drivers licence and at step 11 the image of the document is captured. At step 12 if the document image is captured and the signal from the motion sensor matches the change from facial image orientation to document capture orientation, the liveness of the user is confirmed at step 12.

[014] If step 9 does not match the signal from the motion sensor 7 with the expected movement of the device the CPU reports a liveness rejection.

Claims

1. A mobile device liveness detection system having;

a processor;

a memory;

a front facing visual display unit and control panel;

at least a front facing camera; and

a motion sensor

said device responsive to a control action to run executable code stored in said memory on said processor;

said processor responsive to said code to switch said front facing camera to an on condition;

said processor acting to present instructions to the user to frame an image of their face in the visual display unit using the front facing camera in a face capture orientation, said processor responsive to the facial image being framed according to predetermined parameters to capture the facial image;

said processor responsive to capturing the facial image to present instructions to the user to move the device and hence the field of view of the front facing camera to a document capture orientation, different from the face capture orientation, where an identity document is framed for capture by the front facing camera;

characterised in that the executable code drives the processor to be responsive to the motion sensor sensing the movement of the device from the face capture orientation to the identity document orientation to verify liveness detection.

2. A package of machine readable code stored in memory for communication to a device having a processor; a memory; a front facing visual display unit and control panel; at least a front facing camera; and a motion sensor, for installation in said device in executable form to implement the system of claim 1 on said device.



Application No: GB1812308.3

Examiner: Mr Philip Rogers

Claims searched: 1-2

Date of search: 23 January 2019

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	US2018/173980 A1 (FAN et al.) - See paragraph [0223]
A	-	GB2532613 A (IPROOV LIMITED) - See paragraphs 46 and 48
A	-	WO2016/183406 A1 (CAPTIAL ONE SERVICES LLC) - See paragraph [058]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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Worldwide search of patent documents classified in the following areas of the IPC

A61B; G06F; G06K; H04L

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI, Patent Fulltext

International Classification:

Subclass	Subgroup	Valid From
G06K	0009/00	01/01/2006
G06F	0021/32	01/01/2013