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(54) **SYSTEMS AND METHODS FOR ADJUSTING FLIGHT CONTROL OF AN UNMANNED AERIAL VEHICLE**

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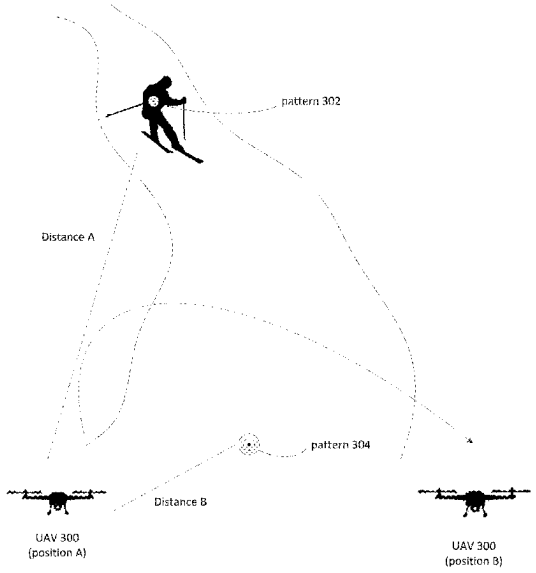
(57) **ABSTRACT**

An unmanned aerial vehicle including an image sensor and one or more processors. The image sensor is carried by the unmanned aerial vehicle and is configured to generate output signals conveying visual information. The one or more processors include a distance component and a flight control component. The distance component configured to determine a distance between an object of interest and the unmanned aerial vehicle. The flight control component is configured to adjust a flight path of the unmanned aerial vehicle based on the distance between the object of interest and the unmanned aerial vehicle. The one or more processors are configured to: receive the visual information including the object of interest; and control the image sensor with a sensor control subsystem to adjust one or more parameters of the image sensor and to detect the object of interest.

20 Claims, 4 Drawing Sheets



Related U.S. Application Data

continuation of application No. 15/807,399, filed on Nov. 8, 2017, now Pat. No. 10,599,139, which is a continuation of application No. 15/264,216, filed on Sep. 13, 2016, now Pat. No. 9,817,394, which is a continuation of application No. 14/989,738, filed on Jan. 6, 2016, now Pat. No. 9,758,246.

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B64U 101/30	(2023.01)

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See application file for complete search history.

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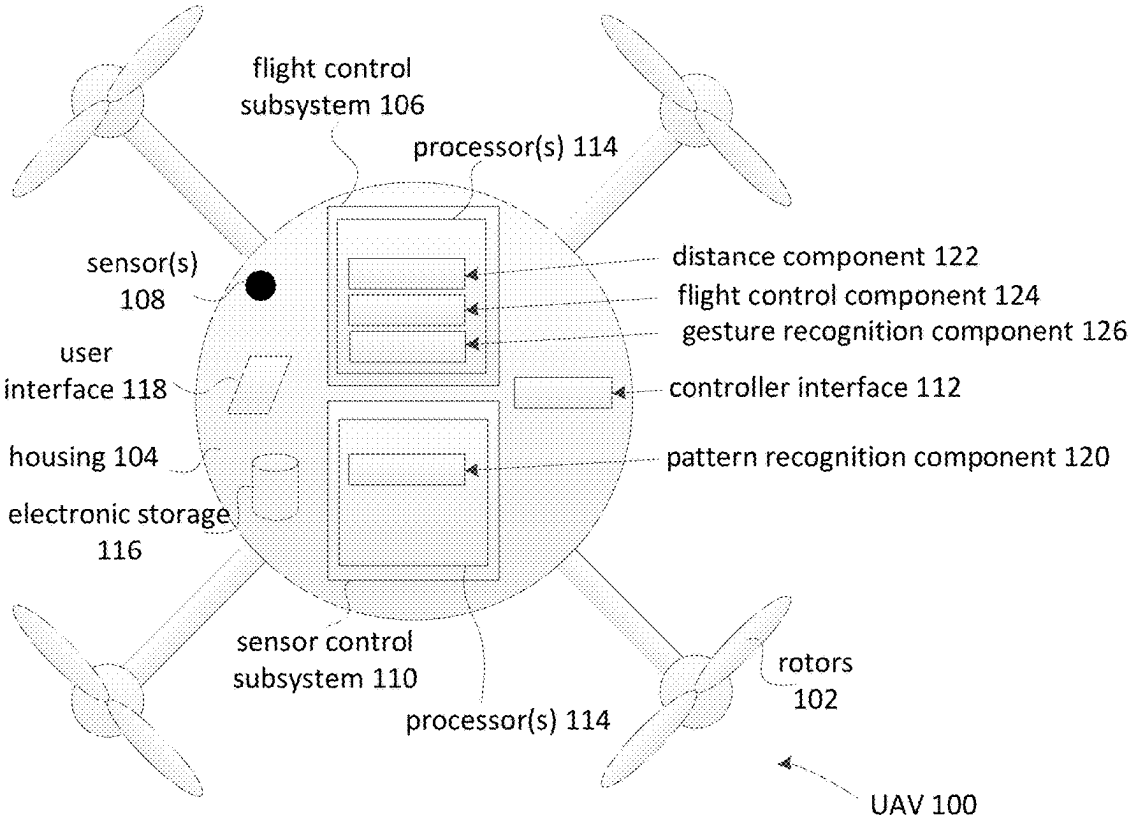
flight control subsystem 106
processor(s) 114
sensor(s) 108
distance component 122
flight control component 124
gesture recognition component 126
user interface 118
controller interface 112
housing 104
pattern recognition component 120
electronic storage 116
sensor control subsystem 110
processor(s) 114
rotors 102
UAV 100

FIG. 1

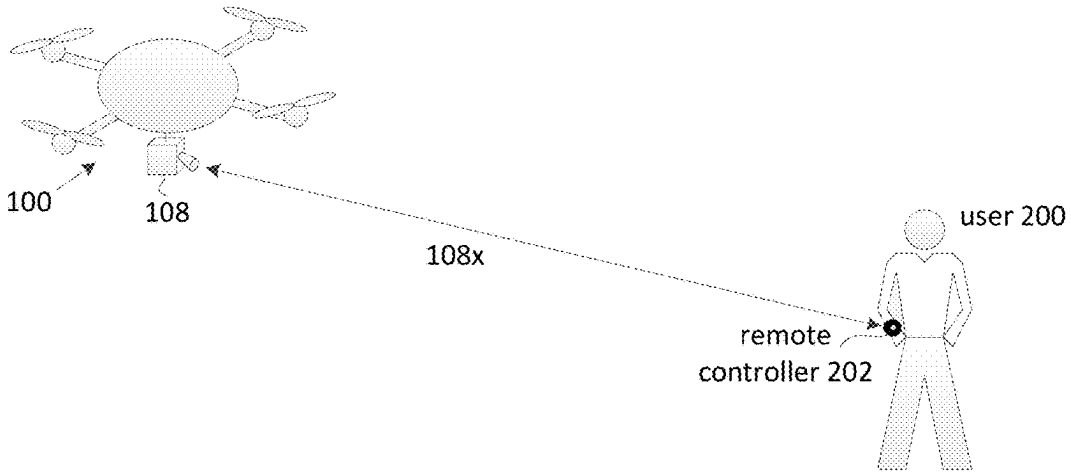
100
108
108x
user 200
remote controller 202

FIG. 2

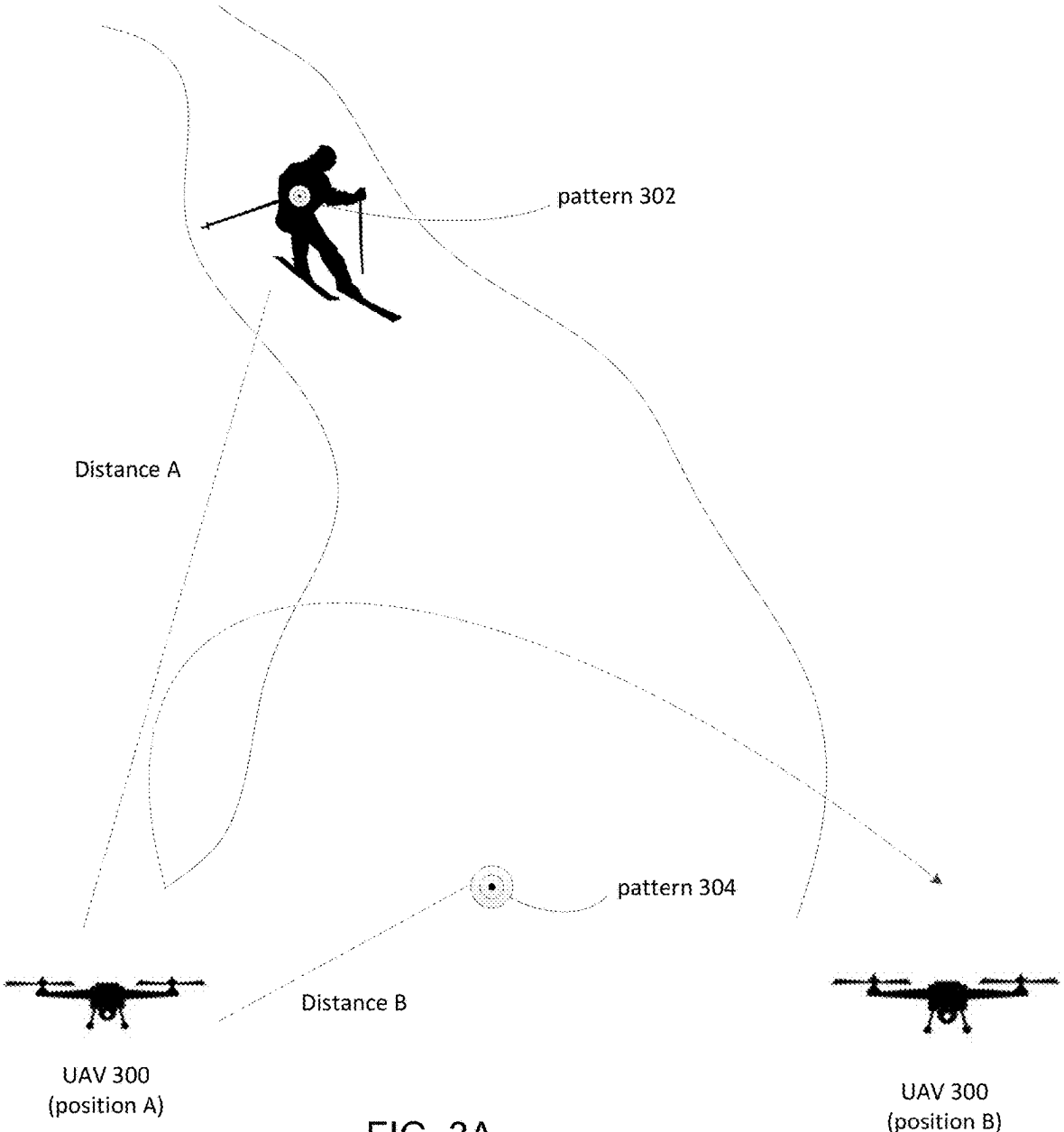
pattern 302
Distance A
pattern 304
Distance B
UAV 300
(position A)
UAV 300
(position B)

FIG. 3A

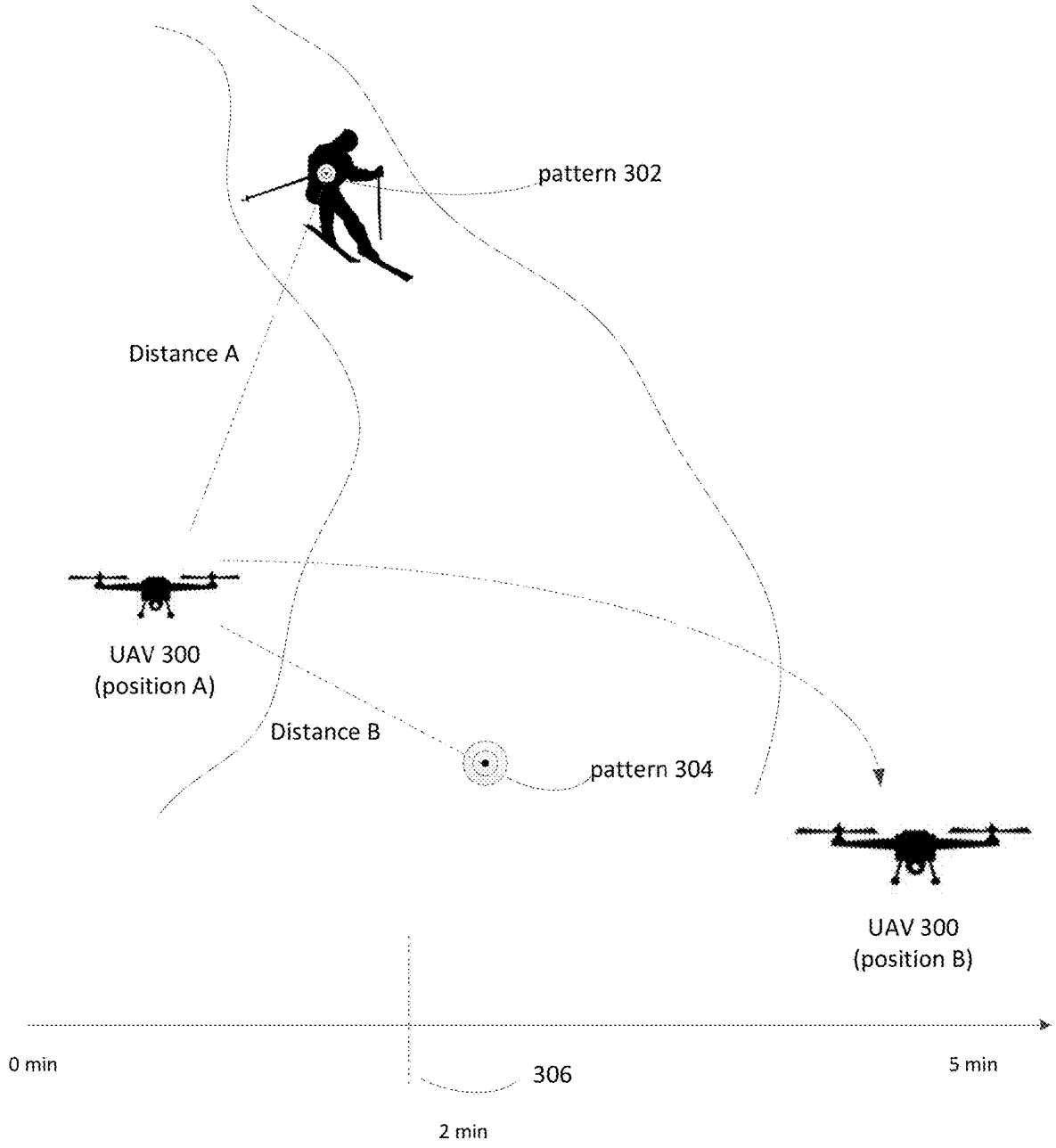
pattern 302
Distance A
UAV 300
(position A)
Distance B
pattern 304
UAV 300
(position B)
0 min
306
5 min
2 min

FIG. 3B

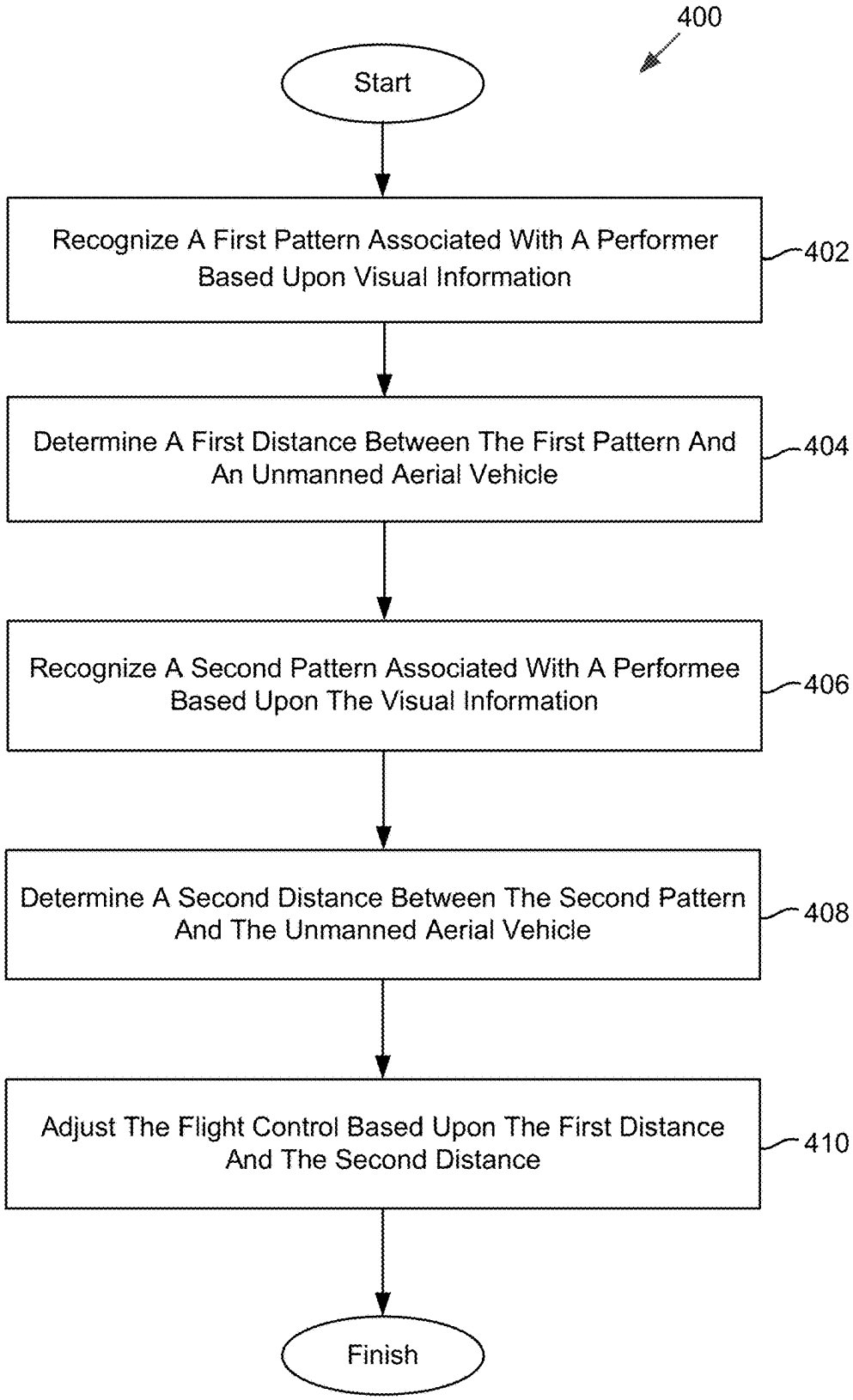
400
Start
Recognize A First Pattern Associated With A Performer Based Upon Visual Information
402
Determine A First Distance Between The First Pattern And An Unmanned Aerial Vehicle
404
Recognize A Second Pattern Associated With A Performee Based Upon The Visual Information
406
Determine A Second Distance Between The Second Pattern And The Unmanned Aerial Vehicle
408
Adjust The Flight Control Based Upon The First Distance And The Second Distance
410
Finish

FIG. 4

SYSTEMS AND METHODS FOR ADJUSTING FLIGHT CONTROL OF AN UNMANNED AERIAL VEHICLE

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation of U.S. patent application Ser. No. 16/827,241 filed on Mar. 23, 2020, which is a continuation of U.S. patent application Ser. No. 15/807,399, filed Nov. 8, 2017, now U.S. Pat. No. 10,599,139, which is a continuation of U.S. patent application Ser. No. 15/264,216, filed Sep. 13, 2016, now U.S. Pat. No. 9,817,394, which is a continuation of U.S. patent application Ser. No. 14/989,738, filed Jan. 6, 2016, now U.S. Pat. No. 9,758,246, the entire disclosures of which are hereby incorporated by reference.

TECHNICAL FIELD

The disclosure relates to systems and methods for adjusting flight control of an unmanned aerial vehicle.

BACKGROUND

Unmanned aerial vehicles, or UAVs, may be equipped with automated flight control, remote flight control, programmable flight control, other types of flight control, and/or combinations thereof. Some UAVs may include sensors, including but not limited to, image sensors configured to capture image information. UAVs may be used to capture special moments, sporting events, concerts, etc. UAVs may be preconfigured with particular flight control settings. The preconfigured flight control settings may not be individualized for what is being captured. Configuration may take place through manual manipulation by the user. Adjustment of flight control settings may impact various aspects of images and/or videos captured by the image sensors of the UAV.

SUMMARY

The disclosure relates to an unmanned aerial vehicle including an image sensor and one or more processors. The image sensor is carried by the unmanned aerial vehicle and is configured to generate output signals conveying visual information. The one or more processors include a distance component and a flight control component. The distance component configured to determine a distance between an object of interest and the unmanned aerial vehicle. The flight control component is configured to adjust a flight path of the unmanned aerial vehicle based on the distance between the object of interest and the unmanned aerial vehicle. The one or more processors are configured to: receive the visual information including the object of interest; and control the image sensor with a sensor control subsystem to adjust one or more parameters of the image sensor and to detect the object of interest.

The disclosure relates to a method including: controlling an image sensor and adjusting a flight path of an unmanned aerial vehicle. Controlling an image sensor, carried on an unmanned aerial vehicle, with a sensor control subsystem that adjusts one or more parameters of the image sensor. Detecting objects of interest with the image sensor. Generating output signals with the image sensor. Generating visual information regarding the objects of interest. Conveying the output signals and the visual information to one or more processors. The one or more processors comprise: a distance component and a flight control component. Determining, by the distance component, distances between the objects of interest and the unmanned aerial vehicle. Adjusting, by the flight control component, a flight path of the unmanned aerial vehicle based on the distances between the objects of interest and the unmanned aerial vehicle.

The disclosure relates to a flight control subsystem including: one or processors. The one or more processors comprise: a distance component, a flight component, and a gesture recognition component. The distance component is configured to determine distances between an unmanned aerial vehicle and objects of interest or a performer. The flight control component is configured to adjust flight control of the unmanned aerial vehicle based upon the distances between the unmanned aerial vehicle and the objects of interest or the performer. The gesture recognition component configured to determine and/or recognize one or more patterns, positions, and/or movements of hands of the performer. The flight control subsystem is in communication with an is configured to control the unmanned aerial vehicle. The distance component is in communication with one or more sensors that assist the distance component in determining the distances.

The disclosure relates to adjusting flight control of an unmanned aerial vehicle based upon distances between the UAV and objects being captured by the UAV, in accordance with one or more implementations. Adjustment of flight control may facilitate enhanced capture when two or more objects become coincident in space and time. By determining distances between the UAV and the objects, the UAV may be controlled to be "in position" for capture of the coincidence of the objects. The objects may include a performer and a performee. By monitoring respective positions and/or distances of the performer and the performee with respect to the UAV, the UAV may be controlled to be prepared for movement of the performer and the performee toward each other for performance of the interaction between the performer and the performee.

The system for adjusting flight control of the UAV may include one or more of a housing, a flight control subsystem, one or more sensors, a sensor control subsystem, a controller interface, one or more physical processors, one or more computer program components, and/or other components. An individual subsystem may include one or more sensors, one or more physical processors, one or more computer program components, and/or other components.

Individual physical processors may be configured via computer-readable instructions to provide information-processing capabilities and/or execute computer program components. The computer program components may include one or more of a pattern recognition component, a distance component, a flight control component, a gesture recognition component, and/or other components.

The flight control subsystem may be configured to provide flight control for the UAV. By way of non-limiting example, the flight control subsystem may be configured to control one or more of an altitude, a longitude, a latitude, a geographical location, a heading, a speed of the UAV, and/or other flight controls. Operation of the flight control subsystem may be based upon flight control information. Flight control information may be based upon information determined and/or obtained to control the UAV. In some implementations, providing flight control may include functions including, but not limited to, flying the UAV in a stable manner, tracking people or objects, avoiding collisions, and/or other functions useful for autonomously flying

unmanned aerial vehicles. In some implementations, flight control information may be transmitted by a remote controller. In some implementations, flight control information may be received by the controller interface by the remote controller.

One or more sensors may be configured to generate output signals conveying information. The information may include visual information, video information, audio information, geolocation information, orientation and/or motion information, depth information, and/or other information. Information captured by the one or more sensors may be marked, timestamped, annotated, and/or otherwise processed such that information captured by other sensors (e.g., other sensors from the one or more sensors of the UAV) may be synchronized, aligned, annotated, and/or otherwise associated therewith. In some implementations, the conveyed information may be related to one or more flight control information of the UAV. In some implementations, the conveyed information may be related to sensor control information. In some implementations, the conveyed information may be related to persons and/or objects near the UAV and/or the user.

The sensor control subsystem may be configured to control the one or more sensors included within the UAV and/or other sensors. By way of non-limiting example, the sensor control subsystem may be configured to control the one or more sensors through adjustments of one or more of aperture timing, exposure, focal length, angle of view, depth of field, focus, light metering, white balance, resolution, frame rate, object of focus, capture angle, a zoom parameter, video format, a sound parameter, a compression parameter, and/or other sensor parameters. Operation of the sensor control subsystem may be based upon sensor control information. Sensor control information may be based upon information and/or parameters determined and/or obtained by the UAV and/or components thereof. In some implementations, sensor control information may be transmitted by a remote controller. In some implementations, sensor control information may be received by the controller interface. In some implementations, the sensor control subsystem may be configured to control one or more image sensors such that the visual information captured by the one or more image sensors may include an image of a particular object or user.

The pattern recognition component may be configured to recognize a first pattern associated with a performer based on the visual information. The UAV, one of the processors included within the UAV, the remote controller, and/or other components configured to project a pattern may be configured to project the pattern on the performer. The performer may include a dynamic or moving object, person, place, and/or other performer. In some implementations, the pattern may be a visual pattern. For example, the pattern may include a barcode, a QR code, a target, and/or other patterns, and/or combinations thereof. In some implementations, the UAV, one of the processors included within the UAV, the remote controller, and/or other components configured to project the pattern may include and/or control a component configured to emit electromagnetic radiation. The electromagnetic radiation may produce the pattern (e.g., a visual pattern). In some implementations, particular information (including but not limited to commands, requests, targets, goals, etc.) may be embedded in the pattern. For example, flight control information and/or sensor control information may be entered, received, and/or confirmed through a user interface associated with the remote controller. This information may be converted to, embedded in, and/or otherwise processed into one or more patterns for projection.

The pattern recognition component may be configured to recognize a second pattern associated with a performee based on the visual information. The pattern recognition component may be configured to recognize the second pattern associated with the performee in a similar manner as discussed above. The first pattern and the second pattern may be different patterns and may be distinguishable by the pattern recognition component **20**. The performee may include a static or non-moving object, person, place, and/or other performee. While the performer has been described as dynamic or moving and the performee has been described as static or non-moving, this is not meant to be a limitation of this disclosure, as the performer and the performee may both be dynamic (e.g., the performer and the performee may move at different, the same, and/or varying speeds) or may both be static.

The performer and the performee may be associated with one another. For example, the performer may be a skier. The skier may be marked with the first pattern (e.g., the first pattern is projected on the skier and/or the skier is wearing an identifying pattern). The skier may plan to perform a particular jump at or near the end of a ski slope. The particular location at or near the end of the ski slope where the skier may be performing the particular jump may be marked with the second pattern (e.g., the second pattern is projected at the location at or near the end of the ski slope and/or the location may be marked with an identifying pattern). In another example, a skateboarder may be marked with the first pattern. The skateboarder may plan to perform a particular trick at a location 50 yards from where the skateboarder begins skateboarding. The location at which the skateboarder plans to perform the particular trick may be marked with the second pattern.

The distance component may be configured to determine a first distance between the first pattern and the unmanned aerial vehicle. The first distance may represent a distance between the first pattern (e.g., the performer) and the UAV. For example, the distance component may be configured to determine an altitude of the UAV based upon one or more sensors (e.g., via an altimeter, an image sensor, a distance measurement sensor, etc.). Based upon the altimeter and/or other sensor/device configured to determine measurements of distance, the distance component may be configured to determine the first distance between the first pattern and the unmanned aerial vehicle. The distance component may be configured to determine a second distance between the second pattern (e.g., the performee) and the unmanned aerial vehicle in a similar manner as discussed above.

The flight control component may be configured to adjust the flight control of the unmanned aerial vehicle based upon the first distance and the second distance. The UAV may be configured to capture a video segment including the performer and the performee within a single field of view of an image capturing device of the UAV. The UAV may be configured to maintain a particular distance from the second pattern (e.g., the performee) in preparation for the first pattern (e.g., the performer) approaching the second pattern. The UAV may hover in a location such that the performer and the performee may both be simultaneously captured within the field of view while the UAV **100** remains closer to the second pattern than the first pattern (e.g., the second distance is less than the first distance). For example, patterns (e.g., the first pattern and the second pattern) may include information embedded within them. The embedded information may include commands, requests, targets, and/or goals for the operation of the UAV, including but not limited to flight control information and/or sensor control informa-

tion. The flight control component may be configured to adjust the flight control such that one or more of a target altitude differential, a target cardinal direction, and/or a target distance is maintained between the unmanned aerial vehicle and the first pattern based upon the first distance and the second distance.

The gesture recognition component may be configured to recognize and/or interpret gestures from the performer. In some implementations, gestures may be recognized and/or interpreted by capturing depth information that includes the performer and analyzing patterns, positions, and/or movements of the performer, or parts of the body of the performer. By way of non-limiting example, the gesture recognition component may be configured to determine and/or recognize one or more patterns, positions, and/or movements of the hands of the performer. In some implementations, individual particular patterns, positions, and/or movements of the hands of the performer may correspond to particular commands and/or requests to the UAV to perform an action or operation. Performance of an action or operation by the UAV and/or components thereof may correspond to one or both of flight control information and sensor control information.

These and other objects, features, and characteristics of the system and/or method disclosed herein, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and in the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a system for adjusting flight control of an unmanned aerial vehicle, in accordance with one or more implementations.

FIG. **2** illustrates a scene including an unmanned aerial vehicle and a user, in accordance with one or more implementations.

FIGS. **3**A-**3**B illustrate adjusting flight control of an unmanned aerial vehicle based upon a first pattern and a second pattern in accordance with one or more implementations.

FIG. **4** illustrates a method for adjusting flight control of an unmanned aerial vehicle, in accordance with one or more implementations.

DETAILED DESCRIPTION

FIG. **1** schematically illustrates an unmanned aerial vehicle **100** (also referred to as UAV **100**), in particular a quadcopter. This quadcopter is an exemplary and non-limiting implementation of a UAV. The term "unmanned" may refer to the capability of the aerial vehicle to operate without requiring a human operator during a flight. At least some portion of the flight control may be provided remotely and/or by an autopilot (also referred to as a control system or a control subsystem or a flight control subsystem). In some implementations, UAVs may carry passengers, cargo, sensors, and/or other physical objects. In some implementations, UAVs may operate autonomously. Alternatively, and/or simultaneously, in some implementations, at least some functionality of UAVs may be controlled and/or modified through a remote control (e.g., by a user) for at least some portion of a flight. For example, the user may control and/or assist remotely in a particular maneuver, such as a take-off or landing.

UAVs may be a fixed wing aircraft, a helicopter, a multi-rotor aircraft (e.g. a quadcopter), a rotary wing aircraft, and/or another type of aircraft. In some implementations, UAVs may combine features of multiple types of aircraft. UAVs may include one or more components configured to provide lift force. By way of a non-limiting example, the one or more components providing lift force may include one or more wings, airfoils, propellers, rotors, rotor discs, and/or other components.

Autonomous operation and remote control operation may be provided during the same flight. By way of non-limiting example, the modes of operation of UAVs may include autonomous operation, remote control operation, combinations thereof, and/or other modes of operation. UAVs may have varying degrees of autonomy.

A control system may provide one or more of stabilization control, navigation control, altitude control, propulsion control, engine control, and/or other functions needed and/or used during operation of UAVs, which may jointly be referred to as flight control. By way of non-limiting example, UAVs may be configured to provide one or more of the following functions: capture and/or interpret visual information, ground imagery, and/or surrounding imagery, capture and/or interpret sensor data (e.g. radar data), plan a path for UAVs, determine one or more maneuvers to follow or maintain a particular path and/or other goal or target, to reach a particular destination, or to accomplish a goal or target, avoid obstacles and/or collisions, accommodate in-flight instructions (e.g. from a user and/or a control tower or similar authority), coordinate with external agents (e.g. other UAVs), and/or other functions.

In some implementations, UAVs may be controlled by a system that supports multiple modes of autonomous operation and/or multiple modes of remote control operation.

As illustrated in FIG. **1**, UAV **100** may include four rotors **102**. The number of rotors **102** of UAV **100** is not intended to be limited by any way, as any number of rotors **102** are possible. UAV **100** may include one or more of housing **104**, flight control subsystem **106**, one or more sensors **108**, sensor control subsystem **110**, controller interface **112**, one or more physical processors **114**, electronic storage **116**, user interface **118**, and/or other components.

Housing **104** may be configured to support, hold, and/or carry UAV **100** and/or components thereof.

Flight control subsystem **106** may include one or more physical processors **114**, and/or other components. Sensor control subsystem **106** may include one or more physical processors **114**, and/or other components. The depiction in FIG. **1** of a single sensor **108** is not intended to be limiting in any way, as UAV **100** may include any number of sensors.

Flight control subsystem **106** may be configured to provide flight control for UAV **100**. By way of non-limiting example, flight control subsystem **106** may be configured to control one or more of an altitude, a longitude, a latitude, a geographical location, a heading, a speed of UAV **100**, and/or other flight controls. Operation of flight control subsystem **106** may be based upon flight control information. Flight control information may be based upon information determined and/or obtained to control UAV **100**. In

some implementations, providing flight control may include functions including, but not limited to, flying UAV **100** in a stable manner, tracking people or objects, avoiding collisions, and/or other functions useful for autonomously flying unmanned aerial vehicles. In some implementations, flight control information may be transmitted by remote controller **202**, as will be discussed in further detail in reference to FIG. **2**. In some implementations, flight control information may be received by controller interface **112** by remote controller **202**.

One or more sensors **108** may be configured to generate output signals conveying information. The information may include visual information, video information, audio information, geolocation information, orientation and/or motion information, depth information, and/or other information. Information captured by one or more sensors **108** may be marked, timestamped, annotated, and/or otherwise processed such that information captured by other sensors (e.g., other sensors from one or more sensors **108** of UAV **100**) may be synchronized, aligned, annotated, and/or otherwise associated therewith. In some implementations, the conveyed information may be related to one or more flight control information of UAV **100**. In some implementations, the conveyed information may be related to sensor control information. In some implementations, the conveyed information may be related to persons and/or objects near UAV **100** and/or the user. One or more sensors **108** may include one or more of an altimeter (e.g. a sonic altimeter, a radar altimeter, and/or other types of altimeters), a barometer, a magnetometer, a pressure sensor (e.g. a static pressure sensor, a dynamic pressure sensor, a pitot sensor, etc.), a thermometer, an accelerometer, a gyroscope, an inertial measurement sensor, global positioning system sensors, a tilt sensor, a motion sensor, a vibration sensor, an image sensor, a camera, an ultrasonic sensor, an infrared sensor, a light sensor, a microphone, an air speed sensor, a ground speed sensor, an altitude sensor, medical sensors (including but not limited to blood pressure sensor, pulse oximeter, heart rate sensor, etc.), degree-of-freedom sensors (e.g. 6-DOF and/or 9-DOF sensors), a compass, and/or other sensors. As used herein, the terms "camera" and/or "image sensor" may include any device that captures images, including but not limited to a single lens-based camera, a camera array, a solid-state camera, a mechanical camera, a digital camera, an image sensor, a depth sensor, a remote sensor, a lidar, an infrared sensor, a (monochrome) complementary metal-oxide-semiconductor (CMOS) sensor, an active pixel sensor, and/or other sensors.

Sensor control subsystem **110** may be configured to control one or more sensors **108** included within UAV **100** and/or other sensors. By way of non-limiting example, sensor control subsystem **110** may be configured to control one or more sensors **108** through adjustments of one or more of aperture timing, exposure, focal length, angle of view, depth of field, focus, light metering, white balance, resolution, frame rate, object of focus, capture angle, a zoom parameter, video format, a sound parameter, a compression parameter, and/or other sensor parameters. Operation of sensor control subsystem **110** may be based upon sensor control information. Sensor control information may be based upon information and/or parameters determined and/or obtained by UAV **100** and/or components thereof. In some implementations, sensor control information may be transmitted by remote controller **202** from FIG. **2**. In some implementations, sensor control information may be received by controller interface **112**. In some implementations, sensor control subsystem **110** may be configured to control one or more image sensors **108** such that the visual information captured by one or more image sensors **108** may include an image of a particular object or user.

By way of non-limiting example, FIG. **2** illustrates a scene including UAV **100** and user **200**. Sensor **108** of UAV **100** is aimed in a direction as indicated by direction **108***x* to capture visual information that includes user **200**. User **200** may include remote controller **202** (e.g., user **200** may be holding remote controller **202**, wearing remote controller **202**, etc.). Remote controller **202** may be configured to transmit information to UAV **100** (e.g., in a direction as indicated by direction **108***x*). In some implementations, remote controller **202** may operate as a beacon to guide UAV **100**. Remote controller **202** may be configured to transmit information, including but not limited to flight control information, sensor control information, and/or other information. In some implementations, remote controller **202** may be a separate, distinct, and/or physically independent component of UAV **100**. In some implementations, remote controller **202** may be a separate, distinct, and/or physically independent component from housing **104** (as shown in FIG. **1**). In some implementations, remote controller **202** may be configured to be supported, worn, held, and/or carried by a user **200**. In some implementations, remote controller **202** may include a user interface (e.g., user interface **118** from FIG. **1**) configured to receive user input. The user input may include flight control information, sensor control information, and/or other information. In some implementations, the user input may include gestures by a user, as will be discussed in further detail below. In some implementations, gesture recognition component **126** from FIG. **1** may be included within remote controller **202**.

Referring back to FIG. **1**, controller interface **112** may be configured to determine and/or receive flight control information, sensor control information, and/or other information. For example, controller interface **112** may be configured to receive flight control information and/or sensor control information from a remote controller (e.g., remote controller **202** from FIG. **2**). In some implementations, controller interface **112** may be included, combined, embedded, and/or otherwise form an integral part of UAV **100** and/or housing **104**.

One or more physical processors **114** may be configured via computer-readable instructions to provide information-processing capabilities and/or execute computer program components. The computer program components may include one or more of a pattern recognition component **120**, a distance component **122**, a flight control component **124**, a gesture recognition component **126**, and/or other components. As depicted in FIG. **1**, UAV **100** may include two separate instances of physical processor **114** that are included in flight control subsystem **106** and in sensor control subsystem **110**. The number of physical processors **114** is not intended to be limited in any way by the depiction in FIG. **1**. The partitioning of physical processors **114** under any component of UAV **100** or any control subsystem is not intended to be limited in any way by the depiction in FIG. **1**.

Pattern recognition component **120** may be configured to recognize a first pattern associated with a performer based on the visual information. UAV **100**, one of processors **114** included within UAV **100**, remote controller **202**, and/or other components configured to project a pattern may be configured to project the pattern on the performer. The performer may include a dynamic or moving object, person, place, and/or other performer. The performer may be the same as user **200** of FIG. **2** and/or may be a different person

or object. In some implementations, the pattern may be a visual pattern. For example, the pattern may include a barcode, a QR code, a target, and/or other patterns, and/or combinations thereof. In some implementations, UAV **100**, one of processors **114** included within UAV **100**, remote controller **202**, and/or other components configured to project the pattern may include and/or control a component configured to emit electromagnetic radiation. The electromagnetic radiation may produce the pattern (e.g., a visual pattern). In some implementations, particular information (including but not limited to commands, requests, targets, goals, etc.) may be embedded in the pattern. For example, flight control information and/or sensor control information may be entered, received, and/or confirmed through a user interface associated with remote controller **202** of FIG. **2**. This information may be converted to, embedded in, and/or otherwise processed into one or more patterns for projection.

Pattern recognition component **120** may be configured to recognize and/or interpret patterns, including but not limited to patterns projected by UAV **100**, one of processors **114** included within UAV **100**, remote controller **202**, and/or other components configured to project the pattern. By way of non-limiting example, patterns may be interpreted as one or both of flight control information and sensor control information. For example, a pattern may be used to tag the performer (e.g., object or person) such that, subsequent to being tagged, UAV **100** may be configured to follow and/or track the tagged performer (e.g., object or person). In some implementations, features attributed to pattern recognition component **120** may be performed at or near user **200** and/or another user. In some implementations, features attributed to pattern recognition component **120** may be performed at or near UAV **100** and/or components thereof. In some implementations, features attributed to pattern recognition component **120** may be performed in part at or near user **200** and/or another user, and in part at or near UAV **100** and/or components thereof.

Pattern recognition component **120** may be configured to recognize a second pattern associated with a performee based on the visual information. Pattern recognition component **120** may be configured to recognize the second pattern associated with the performee in a similar manner as discussed above. The first pattern and the second pattern may be different patterns and may be distinguishable by pattern recognition component **120**. The performee may include a static or non-moving object, person, place, and/or other performee. While the performer has been described as dynamic or moving and the performee has been described as static or non-moving, this is not meant to be a limitation of this disclosure, as the performer and the performee may both be dynamic (e.g., the performer and the performee may move at different, the same, and/or varying speeds) or may both be static.

The performer and the performee may be associated with one another. For example, the performer may be a skier. The skier may be marked with the first pattern (e.g., the first pattern is projected on the skier and/or the skier is wearing an identifying pattern). The skier may plan to perform a particular jump at or near the end of a ski slope. The particular location at or near the end of the ski slope where the skier may be performing the particular jump may be marked with the second pattern (e.g., the second pattern is projected at the location at or near the end of the ski slope and/or the location may be marked with an identifying pattern). In another example, a skateboarder may be marked with the first pattern. The skateboarder may plan to perform a particular trick at a location 50 yards from where the skateboarder begins skateboarding. The location at which the skateboarder plans to perform the particular trick may be marked with the second pattern.

Distance component **122** may be configured to determine a first distance between the first pattern and the unmanned aerial vehicle. The first distance may represent a distance between the first pattern (e.g., the performer) and UAV **100**. For example, distance component **122** may be configured to determine an altitude of UAV **100** based upon one or more sensors **108** (e.g., via an altimeter, an image sensor, a distance measurement sensor, etc.). Based upon the altimeter and/or other sensor/device configured to determine measurements of distance, distance component **122** may be configured to determine the first distance between the first pattern and the unmanned aerial vehicle. Distance component **122** may be configured to determine a second distance between the second pattern (e.g., the performee) and the unmanned aerial vehicle in a similar manner as discussed above.

Flight control component **124** may be configured to adjust the flight control of the unmanned aerial vehicle based upon the first distance and the second distance. UAV **100** may be configured to capture a video segment including the performer and the performee within a single field of view of an image capturing device of UAV **100**. UAV **100** may be configured to maintain a particular distance from the second pattern (e.g., the performee) in preparation for the first pattern (e.g., the performer) approaching the second pattern. UAV **100** may hover in a location such that the performer and the performee may both be simultaneously captured within the field of view while the UAV **100** remains closer to the second pattern than the first pattern (e.g., the second distance is equal to or less than the first distance). For example, patterns (e.g., the first pattern and the second pattern) may include information embedded within them. The embedded information may include commands, requests, targets, and/or goals for the operation of UAV **100**, including but not limited to flight control information and/or sensor control information. For example, pattern recognition component **120** may recognize and interpret the first pattern on the performee as requiring a wide-angle high-resolution panning capture as the first distance approaches the length of the second distance (e.g., as the first distance decreases). Flight control component **124** may adjust the flight control accordingly. In another example, pattern recognition component **120** may recognize and interpret the second pattern on performee as requiring a slow-motion video capture as the first pattern and the second pattern overlap. Flight control component **124** may adjust the flight control accordingly. In some implementations, information may be sent from remote controller **202** to controller interface **112** by a combination of direct transmission and projected patterns that are recognized and interpreted upon being captured by an image sensor.

Flight control component **124** may be configured to adjust the flight control such that one or more of a target altitude differential, a target cardinal direction, and/or a target distance is maintained between the unmanned aerial vehicle and the first pattern based upon the first distance and the second distance. As discussed above, the target altitude differential, the target cardinal direction, and/or the target distance may be embedded within the first pattern and/or the second pattern. For example, a current cardinal direction may be that UAV **100** is positioned East of the first pattern and the second pattern. Subsequent to the first distance decreasing and/or increasing in length, UAV **100** may maneuver itself such that UAV **100** is positioned South of the first pattern and the second pattern such that the target

cardinal direction is maintained. In some implementations, flight control component **124** may be configured to adjust the flight control of UAV **100** by a predetermined number of degrees around the first pattern based upon varying lengths of the first distance and/or the second distance. The flight control may be adjusted such that one or more of the target altitude differential, the target cardinal direction, and/or the target distance is maintained between the unmanned aerial vehicle and the second pattern based upon the first distance and the second distance in a similar manner as discussed above.

By way of non-limiting example, FIG. **3**A illustrates a scene including UAV **100**, a first pattern **302**, and second pattern **304**. First pattern **302** and/or second pattern **304** may be projected (via a remote controller, UAV **100**, or other device) and/or may be applied to the performer (e.g., the skier) and/or performee (e.g., the ski slope) in another manner (e.g., a sticker, etc.). Pattern recognition component **120** (which may be integrated in UAV **100**) may recognize first pattern **302** and second pattern **304**. For example, pattern recognition component **120** may be configured to analyze visual information captured by image sensor **108** (shown in FIG. **1**). The captured visual information may include images of first pattern **302** and second pattern **304**. First pattern **302** and/or second pattern **304** may be interpreted as a command and/or request to UAV **100** to perform an action or operation related to first pattern **302** (e.g., first pattern **302** associated with the skier) and/or second pattern **304** (e.g., second pattern **304** associated with a particular location on the ski slope where a particular action or performance may take place). Distance component **122** may be configured to determine a first distance (e.g., distance A) between UAV **100** and first pattern **302**. Distance component **122** may be configured to determine a second distance (e.g., distance B) between UAV **100** and second pattern **304**. UAV **100** may be configured to capture visual information (via one or more sensors **108** of FIG. **1**) that includes images and/or a video segment of both first pattern **302** and second pattern **304** in the same field of view. While distance A is larger than a predefined distance, UAV **100** may be configured to capture visual information including both the performer and the performee in the same field of view with a wide-angle point of view at an altitude of 20 feet. As distance A becomes shorter (e.g., is a predefined distance) and/or as distance A reaches the length of Distance B, flight control component **124** may be configured to adjust the flight controls of UAV **100** such that UAV **100** re-positions from position A to position B (e.g., form an original position to a new position) and to adjust the sensor controls such that UAV **100** may capture the overlap of pattern **302** and pattern **304** on the East side of the ski slope with a high-resolution, slow-motion, close-up video segment in order to capture the action and/or performance (e.g., a jump at the end of the ski slope) at pattern **304** when the performer (e.g., the skier) associated with pattern **302** collides with pattern **304**. UAV **100** may continue capturing the images and/or video segment as UAV **100** travels from position A to position B (e.g., along a trajectory) in order to capture various angles of the performer associated with pattern **302** approaching pattern **304** during the flight path of UAV **100**.

Returning to FIG. **1**, gesture recognition component **126** may be configured to recognize and/or interpret gestures from the performer, including but not limited to user **200** of FIG. **2**. In some implementations, gestures may be recognized and/or interpreted by capturing depth information that includes the performer and analyzing patterns, positions, and/or movements of the performer, or parts of the body of the performer. By way of non-limiting example, gesture recognition component **126** may be configured to determine and/or recognize one or more patterns, positions, and/or movements of the hands of the performer. In some implementations, individual particular patterns, positions, and/or movements of the hands of the performer may correspond to particular commands and/or requests to UAV **100** to perform an action or operation (e.g., to cause a change in the flight path). Performance of an action or operation by UAV **100** and/or components thereof may correspond to one or both of flight control information and sensor control information. Performance of an action or operation by UAV **100** and/or components thereof may be implemented by one or more of flight control subsystem **106**, sensor control system **110**, and/or other components of UAV **100**. By way of non-limiting example, gestures may be interpreted as one or both of flight control information and sensor control information. In some implementations, features attributed to gesture recognition component **126** may be performed at or near the first pattern and/or the second pattern. In some implementations, features attributed to gesture recognition component **126** may be performed at or near UAV **100** and/or components thereof. In some implementations, features attributed to gesture recognition component **126** may be performed in part at or near the first pattern and/or the second pattern, and in part at or near UAV **100** and/or components thereof.

One or more gestures associated with the performer may be interpreted to adjust one or more of the target altitude differential, the target cardinal direction, and/or the target distance between the unmanned aerial vehicle and the first pattern. For example, a gesture by performer (e.g., a skateboarder) crouching low to his or her skateboard and/or grabbing his or her skateboard may indicate a command and/or request for UAV **100** to decrease its altitude and/or zoom into the performer, as the gesture may indicate that an important trick that the performer is about to perform is approaching. Such a command and/or request may correspond to flight control information that may be used by flight control subsystem **106** to control the position and/or movement of UAV **100**.

One or more gestures associated with the performer may be interpreted to adjust one or more of the target altitude differential, the target cardinal direction, and/or the target distance between the unmanned aerial vehicle and the second pattern. For example, a gesture by the performer of moving both hands from being outstretched and vertical to horizontal and pointing to the second pattern may indicate a command and/or request for UAV **100** to decrease the second distance such that UAV **100** is closer to the second pattern. A gesture by the performer of aiming, poking, and/or thrusting toward an object or person may indicate a command and/or request for UAV **100** to follow and/or track that particular object and/or person instead of the performer. Gestures described in this disclosure are merely exemplary and not intended to be limiting in any way.

In some implementations, gestures may be accompanied by other types of user input, including but not limited to an auditory command, a manipulation of a user interface element (e.g., a button or switch), a tactile action (e.g. tapping a remote controller twice to prime the system for recognizing a gesture), and/or other types of user input. As used in this disclosure, gestures, interpretations, commands, and requests are types of information that may be transmitted by remote controller **202**, received by controller interface **112**, and/or processed by one or more control subsystems and/or computer program components in other ways.

In some implementations, one or more gestures may be interpreted to adjust the zooming factor of sensor **108** (e.g., an image sensor) to capture a wider shot or a narrower shot of the first pattern and/or the second pattern. Such a command and/or request to adjust the zooming factor may correspond to sensor control information that may be used by sensor control subsystem **110** to control the operation of one or more sensors **108**.

One or more processors **114** may be configured to mark the video segment at a point in time in which a third distance between the first pattern and the second pattern is a predefined distance. The third distance may represent a distance between the first pattern and the second pattern. For example, as described above, the first pattern may be associated with the performer (e.g., a dynamic and/or moving object or person). The third distance may vary as the first pattern approaches the second pattern associated with the performee (e.g., a static and/or non-moving object or person). For example, as a skier approaches the particular location on a ski slope where the skier may perform a jump, the third distance may decrease in length. One or more processors **114** may tag and/or mark the visual information (e.g., captured via one or more sensors **108**) while capturing the visual information (e.g., one or more processors **114** may tag and/or mark the video segment in or near real-time) at the point in time in which the third distance is the predefined distance (e.g., when the first pattern and the second pattern are a predefined distance apart). The predefined distance may be a manually entered predefined distance and/or may be preconfigured by one or more processors **114**. The predefined distance may be determined based upon the performer and/or performee (e.g., the action of which the performer is performing, etc.). The tag and/or mark may indicate the point in time during the video segment in which an event may take place in a relatively short time period after the tag and/or mark. During playback of the video segment, a user may quickly jump to the tag and/or mark within the video segment to locate the event within the video segment. The event may be the overlap of the first pattern and the second pattern (e.g., the point in which the performer reaches the performee). The third distance may indicate that the first pattern and the second pattern may overlap in a relatively short time period after the point in time in which the video segment is tagged and/or marked.

One or more processors **114** may be configured to mark the video segment at a point in time in which the first pattern and the second pattern overlap. This may be in addition to the tag and/or mark associated with the third distance, as discussed above, or may be the only tag and/or mark within the captured video segment. The tag and/or mark may indicate the point in time during the video segment in which the event may take place. During playback of the video segment, the user may quickly jump to the tag and/or mark within the video segment to locate the event within the video segment. The event may be the overlap of the first pattern and the second pattern (e.g., the point in which the performer reaches the performee).

In some implementations, one or more gestures may be interpreted as meta-information regarding the information being captured by one or more sensors **108**. For example, a particular gesture may indicate to one or more processors **114** to mark, tag, timestamp, annotate, and/or otherwise process visual information captured by one or more sensors **108** in or near real-time. In some implementations, a particular gesture may be used to synchronize, align, annotate, and/or otherwise associate captured visual information with a particular person, object, moment, and/or duration/event.

Continuing the example above from FIG. **3**A, FIG. **3**B illustrates one or more processors (not shown in FIG. **3**B) marking the captured video segment at tag **306** in or near real-time while capturing the video segment of the performer and the performee. For example, UAV **100** may mark and/or tag the video segment when first pattern **302** is a predefined distance apart from second pattern **304** (e.g., as shown in FIG. **3**B, UAV **100** may mark the video segment at 2 minutes, as indicated by tag **306**). UAV **100** may mark and/or tag the video segment at the point in time when first pattern **302** and second pattern **304** overlap. UAV **100** may mark and/or tag the video segment if gesture recognition component **126** recognizes a particular gesture by the performer associated with pattern **302** and/or another user indicating an action to mark and/or tag the video segment while capturing the visual information at that point in time. In this manner, a user may jump to tag **306** to quickly view the action and/or performance that may take place when first pattern **302** and second pattern **304** overlap and/or collide.

The depiction in FIG. **1** of flight control subsystem **106** including and/or executing distance component **122**, flight control component **124**, and/or gesture recognition component **126** is not intended to be limiting in any way. In some implementations, distance component **122**, flight control component **124**, and/or gesture recognition component **126** may be included in and/or executed by sensor control subsystem **110** and/or any other component of UAV **100**. Similarly, the depiction in FIG. **1** of sensor control subsystem **110** including and/or executing pattern recognition component **120** is not intended to be limiting in any way. In some implementations, pattern recognition component **120** may be included in and/or executed by flight control subsystem **106** and/or any other component of UAV **100**. The location or depiction of a particular computer program component in FIG. **1** is merely exemplary, and not intended to be limiting in any way.

One or more physical processors **114** may include one or more of a digital processor, an analog processor, a digital circuit designed to process information, a central processing unit, a graphics processing unit, an analog circuit designed to process information, and/or other mechanisms for electronically processing information. In some implementations, physical processor **114** may include a plurality of processing units.

It should be appreciated that although components **120**, **122**, **124**, and **126** are illustrated in FIG. **1** as being located and/or co-located within a particular component of UAV **10**, in implementations in which physical processor **114** includes multiple processing units, one or more of components **120**, **122**, **124**, and/or **126** may be located remotely from the other components. The description of the functionality provided by the different components **120**, **122**, **124**, and/or **126** described herein is for illustrative purposes, and is not intended to be limiting, as any of components **120**, **122**, **124**, and/or **126** may provide more or less functionality than is described. For example, one or more of components **120**, **122**, **124**, and/or **126** may be eliminated, and some or all of its functionality may be incorporated, shared, integrated into, and/or otherwise provided by other ones of components **120**, **122**, **124**, and/or **126**. Note that physical processor **114** may be configured to execute one or more additional components that may perform some or all of the functionality attributed below to one of components **120**, **122**, **124**, and/or **126**.

Electronic storage **116** in FIG. **1** may comprise electronic storage media that electronically stores information. The electronic storage media of electronic storage **116** may

include one or both of system storage that is provided integrally (i.e., substantially non-removable) with UAV **100** and/or removable storage that is connectable to UAV **100** via, for example, a port (e.g., a USB port, a Firewire port, etc.) or a drive (e.g., a disk drive, etc.). Electronic storage **116** may include one or more of optically readable storage media (e.g., optical disks, etc.), magnetically readable storage media (e.g., magnetic tape, magnetic hard drive, floppy drive, etc.), electrical charge-based storage media (e.g., EPROM, EEPROM, RAM, etc.), solid-state storage media (e.g., flash drive, etc.), and/or other electronically readable storage media. Electronic storage **116** may store software algorithms, information determined by physical processor **114** or any computer program components, information received via user interface **118**, and/or other information that enables UAV **100** to function properly. For example, electronic storage **116** may store captured visual information (as discussed elsewhere herein), and/or other information. Electronic storage **116** may be a separate component within UAV **100**, or electronic storage **116** may be provided integrally with one or more other components of UAV **100** (e.g., physical processor **114**).

User interface **118** of UAV **100** in FIG. **1** may be configured to provide an interface between UAV **100** and a user (e.g. a remote user using a graphical user interface) through which the user can provide information to and receive information from UAV **100**. This may enable data, results, and/or instructions and any other communicable items, collectively referred to as "information," to be communicated between the user and UAV **100**. Examples of interface devices suitable for inclusion in user interface **118** include a keypad, buttons, switches, a keyboard, knobs, levers, a display screen, a touch screen, speakers, a microphone, an indicator light, an audible alarm, and a printer. Information may be provided to a user by user interface **118** in the form of auditory signals, visual signals, tactile signals, and/or other sensory signals.

It is to be understood that other communication techniques, either hard-wired or wireless, are also contemplated herein as user interface **118**. For example, in one embodiment, user interface **118** may be integrated with a removable storage interface provided by electronic storage **116**. In this example, information is loaded into UAV **100** from removable storage (e.g., a smart card, a flash drive, a removable disk, etc.) that enables the user(s) to customize UAV **100**. Other exemplary input devices and techniques adapted for use with UAV **100** as user interface **118** may include, but are not limited to, an RS-232 port, RF link, an IR link, modem (telephone, cable, Ethernet, internet or other). In short, any technique for communicating information with UAV **100** may be contemplated as user interface **118**.

FIG. **4** illustrates a method **400** for adjusting flight control of an unmanned aerial vehicle. The operations of method **400** presented below are intended to be illustrative. In certain implementations, method **400** may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed. Additionally, the order in which the operations of method **400** are illustrated in FIG. **4** and described below is not intended to be limiting.

In certain implementations, method **400** may be implemented in one or more processing devices (e.g., a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, and/or other mechanisms for electronically processing information). The one or more processing devices may include one or more devices executing some or all of the operations of method **400** in response to instructions stored electronically on an electronic storage medium. The one or more processing devices may include one or more devices configured through hardware, firmware, and/or software to be specifically designed for execution of one or more of the operations of method **400**.

Regarding method **400**, at an operation **402**, a first pattern associated with a performer may be recognized based upon visual information. In some embodiments, operation **402** may be performed by a pattern recognition component that is the same as or similar to pattern recognition component **120** (shown in FIG. **1** and described herein).

At an operation **404**, a first distance between the first pattern and the unmanned aerial vehicle may be determined. In some embodiments, operation **402** may be performed by a distance component that is the same as or similar to distance component **122** (shown in FIG. **1** and described herein).

At an operation **406**, a second pattern associated with a performee may be recognized based upon visual information. In some embodiments, operation **406** may be performed by a pattern recognition component that is the same as or similar to pattern recognition component **120** (shown in FIG. **1** and described herein).

At an operation **408**, a second distance between the second pattern and the unmanned aerial vehicle may be determined. In some embodiments, operation **408** may be performed by a distance component that is the same as or similar to distance component **122** (shown in FIG. **1** and described herein).

At an operation **410**, the flight control may be adjusted based upon the first distance and the second distance. In some embodiments, operation **410** is performed by a flight control component the same as or similar to flight control component **124** (shown in FIG. **1** and described herein).

Although the invention has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred implementations, it is to be understood that such detail is solely for that purpose and that the invention is not limited to the disclosed implementations, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present invention contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

What is claimed is:

1. An unmanned aerial vehicle comprising:

an image sensor carried by the unmanned aerial vehicle, the image sensor configured to generate output signals conveying visual information; and

one or more processors comprising:

a distance component configured to determine a distance between an object of interest and the unmanned aerial vehicle, via the visual information captured by the image sensor, as the object of interest travels along a trajectory and to determine a second distance between the unmanned aerial vehicle and a location of interest, wherein the location of interest is a location of a future event;

a flight control component configured to adjust a flight path of the unmanned aerial vehicle based on at least the distance between the object of interest and the unmanned aerial vehicle; and

a pattern recognition component configured to recognize the trajectory associated with the object of

interest based on the visual information captured by the image sensor; wherein the one or more processors are configured to:

receive the visual information from the image sensor including the object of interest and the location of interest;

control the image sensor with a sensor control subsystem to adjust one or more parameters of the image sensor and to detect the object of interest;

control the unmanned aerial vehicle as the object of interest travels along the trajectory so that the object of interest is detected within a field of view of the image sensor as the object of interest approaches the location of interest;

control the unmanned aerial vehicle to re-position the unmanned aerial vehicle relative to the location of interest in preparation for the future event so that the future event is captured with the image sensor during an overlap of the object of interest and the location of interest; and

tag a location where the future event is captured with the image sensor, wherein the unmanned aerial vehicle continues to detect the object of interest as the unmanned aerial vehicle re-positions.

2. The unmanned aerial vehicle of claim **1**, wherein the flight control component adjusts the flight path based on one or more of a target altitude differential, a target cardinal direction, and a target distance maintained between the unmanned aerial vehicle and the object of interest.

3. The unmanned aerial vehicle of claim **1**, wherein the flight control component adjusts the flight path of the unmanned aerial vehicle based upon the distance.

4. The unmanned aerial vehicle of claim **3**, wherein the flight control component maintains one or more of a target altitude differential, a target cardinal direction, and/or a target distance between the unmanned aerial vehicle and the object of interest based upon the distance.

5. The unmanned aerial vehicle of claim **1**, wherein the unmanned aerial vehicle re-positions when the distance between the object of interest and the unmanned aerial vehicle is equal to or less than the distance between the object of interest and the unmanned aerial vehicle.

6. The unmanned aerial vehicle of claim **1**, further comprising:

a gesture recognition component configured to recognize and/or interpret gestures from a performer, wherein the gesture recognition component recognizes movements of hands of the performer so that the unmanned aerial vehicle performs an action or operation associated with a change in the flight path.

7. The unmanned aerial vehicle of claim **1**, further comprising:

a gesture recognition component configured to recognize and/or interpret gestures from a performer, wherein the gesture recognition component recognizes a tactile action associated with a remote controller that is in communication with the unmanned aerial vehicle.

8. The unmanned aerial vehicle of claim **7**, wherein the tactile action is tapping the remote controller and the remote controller is configured to transmit a command associated with the tactile action to the unmanned aerial vehicle so that the command is processed by the flight control component to control the unmanned aerial vehicle.

9. A method comprising:

controlling an image sensor, carried on an unmanned aerial vehicle, with a sensor control subsystem that adjusts one or more parameters of the image sensor;

detecting an object of interest, a location of interest, or both with the image sensor;

generating output signals with the image sensor;

generating visual information based on the detected object of interest;

conveying the output signals and the visual information to one or more processors comprising: a distance component and a flight control component;

determining, with the distance component and the visual information captured by the image sensor, a distance between the object of interest and the unmanned aerial vehicle and a second distance between the unmanned aerial vehicle and a location of interest, wherein the location of interest is a location of a future event;

adjusting, by the flight control component, a flight path of the unmanned aerial vehicle based on at least the distances between the object of interest and the unmanned aerial vehicle;

recognizing, with a pattern recognition component, a trajectory associated with object of interest based on the visual information detected by the image sensor;

continuing to determine the distance between the object of interest and the unmanned aerial vehicle as the object of interest travels along the trajectory;

wherein the controlling comprises operation modes of:

controlling the unmanned aerial vehicle as the object of interest travels along the trajectory so that the object of interest is detected within a field of view of the image sensor as the object of interest approaches the location of interest;

controlling the unmanned aerial vehicle to re-position the unmanned aerial vehicle relative to the location of interest in preparation for the future event so that the future event is captured with the image sensor during an overlap of the object of interest and the location of interest are captured;

tagging a location where the future event is captured with the image sensor; and

continuing to detect the object of interest as the unmanned aerial vehicle re-positions.

10. The method of claim **9**, wherein adjusting the flight path with the flight control component includes controlling one or more of an altitude, a longitude, a latitude, a geographical location, a heading, and/or a speed of the unmanned aerial vehicle.

11. The method of claim **9**, further comprising:

capturing images with the image sensor, wherein the images are a video frame of a video segment.

12. The method of claim **11**, further comprising:

positioning the unmanned aerial vehicle at an original position, with the flight control component, so that the image sensor captures the images; and

repositioning the unmanned aerial vehicle, with the flight control component, from the original position to a new position based upon the distance between the object of interest and the unmanned aerial vehicle being equal to or less than the second distance between the unmanned aerial vehicle and the location of interest.

13. The method of claim **9**, further comprising:

adjusting flight control of the unmanned aerial vehicle, with the flight control component, based upon the distance.

14. The method of claim **13**, further comprising:

providing flight control such that one or more of a target altitude differential, a target cardinal direction, and/or a

target distance is maintained between the unmanned aerial vehicle and the object of interest based upon the distance.

15. The method of claim **9**, further comprising:

recognizing and/or interpreting, using a gesture recognition component within the one or more processors, gestures from a performer.

16. A flight contorl subsystem comprising:

one or more image sensors;

a flight control subsystem comprising:

one or more processors comprising:

a distance component configured to determine a distance between an unmanned aerial vehicle and an object of interest via the visual information captured by the image sensor and a second distance between a location of interest and the unmanned aerial vehicle, wherein the second distance is a location of interest is a location of a future event;

a flight control component configured to adjust flight control of the unmanned aerial vehicle based upon the distance between the unmanned aerial vehicle and the object of interest and the second distance between the location of interest and the unmanned aerial vehicle, and

a sensor control subsystem in communication with the one or more image sensors, the sensor control subsystem comprising:

one or more processors comprising:

a pattern recognition component configured to recognize a trajectory associated with the object of interest based on visual information detected by the one or more image sensors as the object of interest approaches the location of interest;

control the unmanned aerial vehicle to reposition the unmanned aerial vehicle relative to the object of interest in preparation for the future event so that the image sensor of the unmanned aerial vehicle is in position to capture the future event of the object of interest when the object of interest is coincident with the location of interest;

tag a location where the future event is captured with the image sensor; and

control the unmanned aerial vehicle, with the distance component, to re-position the unmanned aerial vehicle when the distance between the object of interest and the unmanned aerial vehicle is equal to or less than the second distance between the location of interest and the unmanned aerial vehicle;

wherein the flight control subsystem is in communication with and is configured to control the unmanned aerial vehicle; and

wherein the distance component is in communication with one or more sensors that assist the distance component in determining the distances and maintaining a particular distance from the object of interest and/or the location of interest based on the trajectory associated with the object of interest.

17. The flight control subsystem of claim **16**, wherein the flight control subsystem is in communication with a sensor control subsystem configured to control operation of the one or more sensors.

18. The flight control subsystem of claim **17**, wherein the pattern recognition component is further configured to recognize the one or more patterns, positions, and/or movements so that the flight control subsystem controls movements of the unmanned aerial vehicle.

19. An unmanned aerial vehicle comprising the flight control subsystem of claim **18**, comprising:

a housing comprising the flight control subsystem, the sensor control subsystem, and the one or more sensors; and

electronic storage that stores the visual information captured by the one or more sensors.

20. The flight control subsystem of claim **16**, further comprising:

a gesture recognition component that is configured to determine tactile actions associated with a remote controller and the remote controller transmits communications to the flight control subsystem so that flight control is adjusted according to the tactile actions.

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