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Inventor(s)

Boucard; John et al.

MODULAR SYSTEM FOR DRONES

Abstract

A modular system for drones is provided. A chassis can include a coupling mechanism operable to removably couple the chassis with a drone. A plurality of modular components can be operable to be interchangeably coupled with a control component. The modular components can be operable to be detachably coupled with a payload.

Inventors: Boucard; John (Kansas City, MO), Harrell; Jason (Tampa, FL), Lorette; Greg (Kansas City, MO), Holloway; Josh (Overland Park, MO), Garbutt; Griffin (Overland Park, MO)

Applicant: Tesseract Ventures, LLC (Overland Park, KS)

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation-in-part application of (1) U.S. Design patent application Ser. No. 29/989,551, filed on Feb. 13, 2025, (2) U.S. Design patent application Ser. No. 29/989,553, filed on Feb. 13, 2025, (3) U.S. Design patent application Ser. No. 29/989,554, filed on Feb. 13, 2025, (4) U.S. Design patent application Ser. No. 29/989,555, filed on Feb. 13, 2025, and (5) U.S. Design patent application Ser. No. 29/989,556, filed on Feb. 13, 2025, and claims the benefit of (1) U.S. Provisional Patent Application No. 63/552,911, filed on Feb. 13, 2024, (2) U.S. Provisional Patent Application No. 63/711,481, filed on Oct. 24, 2024, each of which is incorporated herein by reference in its entirety for all purposes.

FIELD

[0002] The present disclosure is directed to a modular system operable to couple with drones and provide a plurality of different configurations and capabilities.

BACKGROUND

[0003] Drones have seen rapid technological advancement and widespread adoption across various industries, including agriculture, filmmaking, and delivery services. Drones have also revolutionized modern warfare with their versatility and capabilities.

[0004] Drones can be equipped with various sensors, cameras, and sometimes weapons, allowing them to perform reconnaissance, surveillance, and combat tasks without risking human lives. Drones have evolved to include more capabilities, for example being integral for modern military operations as drones can offer real-time data collection and precision strikes against enemy targets. However, conventional drones have fixed capabilities.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Implementations of the present technology will now be described, by way of example only, with reference to the attached figures.

[0006] FIG. 1A illustrates a perspective view of a drone system including a drone coupled with a modular system, according to the present disclosure.

[0007] FIG. 1B illustrates the drone system landing on a surface.

[0008] FIG. 2A illustrates a drone system with a modular system coupled with the drone via a chassis.

[0009] FIG. 2B illustrates an example chassis.

[0010] FIG. 3 illustrates a control component.

[0011] FIG. 4 illustrates a modular component operable to deploy one or more payloads, such as drone payloads.

[0012] FIG. 5 illustrates example modular components.

[0013] FIG. 6A illustrates a connection payload.

[0014] FIG. 6B illustrates the connection payload establishing a data network.

[0015] FIG. 7A illustrates a camera payload.

[0016] FIG. 7B illustrates the modular system establishing communication network.

[0017] FIG. 8 illustrates a light emitter payload.

[0018] FIG. 9 illustrates an audio payload.

[0019] FIG. 10 illustrates the modular system deploying an explosive payload.

[0020] FIG. 11A illustrates the modular system including a plurality of drone payloads.

[0021] FIG. 11B illustrates the modular system deploying a drone payload.

[0022] FIG. 11C illustrates a plurality of drone payloads that have been deployed.

[0023] FIG. 12A illustrates the modular system including a plurality of dropper modular components.

[0024] FIG. 12B illustrates an exploded view of the dropper modular components.

[0025] FIG. 12C illustrates the modular system including a dropper modular component coupled with an explosive payload.

[0026] FIG. 12D illustrates the modular system including a dropper modular component with an explosive payload and a plurality of drone modular components with drone payloads.

[0027] FIG. 13 illustrates a device communicating with the payload to set up the payload.

[0028] FIG. 14 illustrates a drone system communicatively coupled with a controller, a server, and a base control.

[0029] FIG. 15 illustrates a user interface for tracking and controlling the drone systems and corresponding payloads.

[0030] FIG. 16 is a schematic diagram of a processor which may be employed as shown in FIGS. 1A-15.

DESCRIPTION

[0031] It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures and components have not been described in detail so as not to obscure the related relevant feature being described. Also, the description is not to be considered as limiting the scope of the embodiments described herein. The drawings are not necessarily to scale and the proportions of certain parts may be exaggerated to better illustrate details and features of the present disclosure.

[0032] Several definitions that apply throughout this disclosure will now be presented. The term “coupled” is defined as connected, whether directly or indirectly through intervening components, and is not necessarily limited to physical connections. The term “substantially” is defined to be essentially conforming to the particular dimension, shape or other word that substantially modifies, such that the component need not be exact. For example, substantially cylindrical means that the object resembles a cylinder, but can have one or more deviations from a true cylinder. The term “about” means reasonably close to the particular value. For example, about does not require the exact measurement specified and can be reasonably close. As used herein, the word “about” can include the exact number. The term “near” as used herein is within a short distance from the particular mentioned object. The term “near” can include abutting as well as relatively small distance beyond abutting. The terms “comprising,” “including” and “having” are used interchangeably in this disclosure. The terms “comprising,” “including” and “having” mean to include, but not necessarily be limited to the things so described.

[0033] The presently disclosed modular system is operable to couple with any drone, for example a conventional drone, and provide a plurality of interchangeable modular components that can receive and/or deploy any of a plurality of payloads. The modular system include a chassis that can be removably coupled with a drone. In some examples, the chassis can be coupled with the drone such that no modifications to the drone is needed. Accordingly, the modular system can be retrofit to any conventional drone and provide additional capabilities to the conventional drone.

[0034] The modular components (e.g., connected modules) can be interchangeably coupled with a control component. Each of the modular components can receive and/or deploy corresponding payloads, which can have different functionalities, for example drone, explosives, ballistics, radio repeater, antenna, camera, light emittance, audio recording, audio playback, computing, wireless communication, data relay, seismic monitoring, and/or sensors. By being able to add and/or remove modular components and payloads, the capabilities of the drone via the modular system are increased. Additionally, the modular components and payloads can be easily removably coupled with the control component so that the drone can be fitted with the desired capabilities and functionalities quickly and effortlessly. For example, in a military operation, the operator may need to quickly change the modular components and/or payloads for a particular mission. The modular system allows the operator to easily switch around the functionalities of the drone to fit the desired purpose in the field. The modular system allows the operator to have a variety of functional options available at hand without the need of multiple drones.

[0035] In some examples, the control component can be included in the modular system. The control component can be operable to transmit power, signals, and/or data to other components of the modular system. The control component can include a battery that can provide additional power for the drone and/or the modular system.

[0036] In at least one example, the modular component can include an actuator that can allow for deployment of the one or more payloads. The payloads can include, without being limiting, explosive charges, direct ballistics, drones, light emitters, speakers, antennae, radios, and/or sensors. For example, the drone can be controlled to fly to a destination. When the drone reaches the destination, the actuator can be triggered to release a payload at that destination. In some examples, a plurality of payloads can be operable to communicate and/or work in a coordinated fashion to perform a desired function.

[0037] In at least one example, the modular system can include a controller (e.g., handheld controller, remote controller, phone, tablet, computer, laptop, etc.) that can be operable to transmit instructions to the control component, the modular components, the payloads, and/or the drone. In some examples, the controller can also receive information from the control component, the modular components, the payloads, and/or the drone. The controller can be utilized to control and/or coordinate the different components of the modular system and/or the drone. In some examples, the controller can be worn on the wrist of the operator. In some examples, the controller can be a computer, laptop, tablet, etc. In some examples, the controller can be included in a portable device. The control panel can be touch screen, gesture controlled, mouse controlled, or any other suitable mechanism of control. The controller can allow the operator in the field to control the components of the modular system for the operation.

[0038] In some examples, a lead controller can be communicatively coupled with the components of the modular system and/or the controller. The lead controller can be positioned in a headquarters or a base control. The lead controller can receive the information from the drone, the controller, and/or the modular system and coordinate the operation accordingly. The lead controller can be operable to provide communication between the lead controller and the controller such that the lead operator can communicate with the operator in the field. In some examples, there may be multiple operators in the field with a plurality of drones with modular systems, and the lead operator can coordinate the actions for each of the operators and/or the drones and/or the modular systems.

[0039] The disclosure now turns to FIGS. 1A and 1B, which illustrates an example of a drone system 10. The drone system 10 can include a drone 20. The drone 20 can be an unmanned aerial vehicle that can fly autonomously and/or be controlled remotely by a user. The drone 20 can include a body 22 and one or more propellers 24 coupled with the body 22. The propellers 24 can be operable to generate thrust, allowing the drone 20 to lift off, maintain stability, and/or maneuver in different directions. The drone 20 can provide any of a plurality of functions and corresponding components. For example, the drone 20 can include a camera to capture images and/or videos,

which can include thermal imaging, night vision, and/or infrared imaging. In some examples, the drone **20** can be any conventional drone.

[0040] A modular system **100** can be coupled with the drone **20** to provide additional capabilities to the drone **20**. The modular system **100** can be highly modular and easily configured for rapid deployment to provide flexibility in equipping drones with the right components and functions for the task at hand. The modular system **100** can provide mechanical, electrical, and/or software interfaces allowing connection, control, and/or deployment of payloads **140**, agnostic of the drone **20**. For example, FIG. **1B** illustrates the drone system **10** landing on a surface **12** at a predetermined location to deploy the payloads **140**. As shown in FIG. **1B**, the modular system **100** can include a plurality of legs **26** which can be operable to make contact with the landing surface to stabilize the drone system **10** upon landing. In some examples, the legs **26** can extend from the chassis **110**. In some examples, the legs **26** can extend from the control component **120**.

[0041] The modular system **100** can include a chassis **110**, a control component **120**, and a plurality of modular components **130**.

[0042] In at least one example, the chassis **110** can be operable to removably couple with the drone **20**. In some examples, the chassis **110** can be retrofit to be coupled with the drone **20** (e.g., a conventional drone), without modification needed to the drone **20**. In such examples, the modular system **100** can be operable to be coupled with and provide the additional capabilities to any drone **20**, so long as the drone **20** has the capability of carrying the weight of the modular system **100**. For example, as shown in FIGS. **1A** and **1B**, the chassis **110** can be operable to be coupled with an underside **23** of the body **22** of the drone **20**. The chassis **110** can couple with the drone **20** via latch mechanism, snap-fit connectors, magnets, clasps, quick-release pins, buckles, clips, etc. without deviating from the scope of the disclosure, so long as the chassis **110** is detachably coupled with the drone **20** and does not separate undesirably during the operation. In some examples, as shown in FIGS. **2A-2B**, the chassis **110** can include a coupling mechanism **200** operable to removably couple the chassis **110** with the drone **20**. In some examples, the coupling mechanism **200** can include a flexible strap **2001** operable to be wrapped about the body **22** of the drone **20**. The flexible strap **2001** can be fastened with a closure mechanism **2002** such as a buckle, hook and loop, snap, sliding adjuster, etc. to ensure a tight and adjustable connection that can be released when needed. As shown in FIG. **2B**, the chassis **110** can include an interface **202** which can be detachably coupled with the control component **120**.

[0043] In at least one example, the control component **120** can be coupled with the chassis **110**. In some examples, the control component **120** can include the chassis **110**. In some examples, the chassis **110** can include the control component **120**. In some examples, the control component **120** can be detachably coupled with the chassis **110** such that different chassis **110** can be installed depending on the type of drone **20** and/or the type of control component **120**. In some examples, the control component **120** can be detachably coupled with the chassis **110** such that the control component **120** can be replaced if needed, for example if the control component **120** is damaged and/or malfunctioning. Accordingly, the control component **120** and the chassis **110** provide modularity to the modular system **100**, as the control component **120** and/or the chassis **110** can be interchanged as needed.

[0044] The control component **120** can be operable to provide connectivity, power, and/or control of each of the plurality of modular components **130**. For example, the control component **120** can send a signal to the modular component **130** to cause the modular component **130** to deploy and/or control the payload **140**. In at least one example, the control component **120** can include a processor **1600**, for example as illustrated in FIG. **16**, to control the modular components **130**. FIG. **3** illustrates an example of a control component **120**. The control component **120** can include a body **300** that has a first side **301** and a second side **303**. In some examples, the first side **301** can be proximate the chassis **110** and/or the drone **20** when the control component **120** is coupled with the drone **20**. In some examples, the second side **303** can be opposite the first side **301** such that the

second side **303** is positioned away from the chassis **110** and/or the drone **20** when the control component **120** is coupled with the drone **20**. In some examples, the control component **120** can include a first interface **302** that is operable to detachably couple with the chassis **110**. In some examples, the control component **120** can include a second interface **304** that is operable to detachably couple with a modular component **130**.

[0045] In at least one example, the modular components **130** can be detachably coupled with the control component **120** such that the modular components **130** can be interchanged depending on the function needed, when the modular component **130** needs replacement (e.g., malfunctioning), etc. Accordingly, the modular components **130** can be interchangeably coupled with the control component **120** to provide a variety of functions and capabilities to the modular system **100** and the drone system **10**. The modular components **130** can be coupled with the control component **120** while providing an electrical connection such that the control component **120** can cause the modular components **130** to function as desired (e.g., deploy and/or control the payload **140**).

[0046] In at least one example, the modular components **130** can be operable to be detachably coupled with a payload **140**. Accordingly, the modular component **130** can be operable to receive the payload **140** during transport as the drone **20** moves. In some examples, the modular component **130** can be operable to deploy the payload **140** when the drone **20** arrives to the predetermined location. In some examples, the modular component **130** can cause the payload **140** to function to provide a desired result, such as emit a sound, emit light, etc.

[0047] In some examples, the modular component **130** can include an actuator **402** operable to receive and control (e.g., adjust, control function, deploy, etc.) the payload **140**. Each of the actuators **402** can include one or more receiving portions **404** operable to detachably couple with the payload **140**. For example, the receiving portions **404** can include one or more of the following to couple with the payload **140**: latch mechanism, snap-fit connectors, magnets, clasps, quick-release pins, buckles, clips, etc. The receiving portions **404** can be operable to transition between a connection configuration and a deploy configuration. The connection configuration can maintain the coupling of the payload **140** with the actuator **402**. The deploy configuration can include adjusting the receiving portion **404** (e.g., move a latch, move a bar, open a ring, etc.) so that the payload **140** can be detached from the modular component **130** and deployed. In at least one example, when the actuator **402** of the modular component **130** deploys the payload **140**, the actuator **402** can be operable to transmit a control signal to the payload **140** to cause the payload **140** to detach from the actuator **140**. In some examples, the receiving portion **404** can provide electrical connections such that signals, power, etc. can be passed from the modular component **130** to the payload **140**.

[0048] In at least one example, the modular component **130** can include an interface **400** that is operable to detachably couple with the control component **120** (e.g., the second interface **304**, as illustrated in FIG. 3). The interface **400** can be operable to transmit power and/or signals when coupled with the control component **120**.

[0049] In at least one example, as illustrated in FIG. 4, a modular component **130** can include a plurality of actuators **402**. The actuators **402** can extend vertically downward from a base of the modular component **130**. With such a configuration, the actuator **402** can be operable to restrict horizontal movement of the payload **140** received therein such that the payload **140** deploys vertically downward.

[0050] In at least one example, as illustrated in FIG. 5, the modular component **130** can include the actuators **402** with receiving portions **404** operable to receive interchangeable payloads **140**, for example as illustrated in FIGS. 6A, 7A, 8, 9, 10. In at least one example, the modular component **130** can include an exchangeable unit **502**, such as a battery, which can be coupled with the modular component **130** and/or the control component **120** (e.g., via interface **503**) to provide additional power. In at least one example, the modular component **130** can include an additional modular component **504** that can be coupled with the modular component **130**, the battery **502**,

and/or the control component **120** (e.g., via interface **503**). The modular component **130, 504** can include an actuator **402, 506** which can be operable to receive and control the payload **140**. For example, as illustrated in FIG. **10**, the actuator **402, 506** of the additional modular component **504** includes a receiving portion **404, 508** which can detachably connect to and control (e.g., deploy, send signals, etc.) the payload **140**. As illustrated in FIG. **10**, the payload **1000** can include a latch **1002** which can be operable to couple with a bar receiving portion **508** of the modular component **504**. When actuator **506** of the modular component **504** transitions to the deploy configuration, the payload **1000** can be detached from the modular component **504** and deployed. Accordingly, the additional modular component **130, 504** allows for additional modularity of the modular system **100** by being able to continually add and/or interchange functionalities and capabilities to the drone system **10**.

[0051] Payloads **140** can be operable to expand the functionality of the drone system **10**. For example, payloads **140** can include one or more of the following: explosive charge, ballistic payload, sensor, antenna, radio, camera, speaker, light emitter, and/or drone. In at least one example, the payloads **140** can be remotely controlled. In at least one example, the payloads **140** can be controlled via the modular system **100**, for example via the control component **120** and/or the modular component **130**.

[0052] FIGS. **6A-10** illustrate examples of payloads **140** that can be interchangeably used and/or coupled with the modular system **100** to extend the capabilities of the drone system **10**. Payloads **140**, for example, can include one or more functionalities such as flight, radio repeater, antenna, camera, light emittance, audio recording, audio playback, computing, wireless communication, data relay, seismic monitoring, and/or sensors. As shown in FIGS. **6A-9**, the payload **140** can include a connector interface **142** that is operable to couple with the receiving portion **404** of the modular component **130**. In at least one example, the payload **140** can be operable to provide tactile feedback when coupled with the receiving portion **404** of the modular component **130**.

Accordingly, the user can easily know when the payload **140** is adequately and desirably coupled with the modular component **130**. In some examples, each payload **140** can include a mechanical lock **144** to prevent undesired disengagement when coupled with the modular component **130**.

[0053] FIG. **6A** illustrates a payload **140, 600** that includes an antenna and/or a radio functionality. As shown in FIG. **6B**, the antenna **600** can establish wireless communications and/or be deployed to maximize signal propagation aiding uninterrupted communication. FIG. **7A** illustrates a payload **700** that includes a camera **702** that can identify ideal placement, as illustrated in FIG. **7B**, to ensure adequate coverage. FIG. **8** illustrates a payload **800** that includes a light emitter **802** which can be operable to emit light. For example, the payload **800** can be remotely activated to deter and disorient. FIG. **9** illustrates a payload **900** that includes a speaker **902** which can emit sound. In some examples, the speaker **902** can record sound. In some examples, the payload **900** can be operable to record and/or playback sounds to cause deterrent audio and/or provide instructions. As illustrated in FIG. **10**, a plurality of payloads **140** can be interchanged and included together to function as a unit with the modular system **100** to improve and increase the capabilities of the drone system **10**. In at least one example, the modular components **130** that correspond with the desired payloads **140** can also be interchanged in the modular system **100** to provide for the ability to receive and/or control the desired payloads **140**.

[0054] FIGS. **11A-11C** illustrate a drone system **10** with a modular system **100** that includes a plurality of modular components **130** that are operable to couple with and control drone payloads **140, 1100**. As shown in FIG. **11A**, the drone payloads **1100** are coupled with the modular components **130**. As shown in FIG. **11B**, one of the modular components **130** has received a signal to activate the corresponding drone payload **1100** and detach the drone payload **1100**. FIG. **11C** illustrates the drone payloads **1100**. As shown in FIG. **11C**, the drone payloads **1100** can include a body **1101**, one or more propellers **1102**, and, in some examples, one or more sensors **1104**, such as a camera, speaker, light emitter, etc.

[0055] FIGS. 12A-12D illustrate a modular system **100** that includes a plurality of modular components **130**, **1200** that are operable to receive and deploy (e.g., drop) payloads **140**. The modular components **1200** as illustrated in FIGS. 12A-12B can be operable to deploy a variety of types of payloads **140** with different coupling mechanisms. As shown in FIG. 12B, the control component **120** can include the interface **123** operable to couple (electronically and/or physically) with the chassis **110**. The control component **120**, as illustrated in FIG. 12B, can include a plurality of module receivers **124** operable to couple with the modular components **130**. Different modular components **130** can have different functionalities and shapes, but the coupling components **1202** of the different modular components **130** can be configured to couple with and correspond with the module receivers **124** to provide interchangeability between modular components **130**. Accordingly, the coupling components **1202** for the modular components **130** are all standardized to provide interchangeability.

[0056] As illustrated in FIG. 12B, the modular component **1200** can include a body **1201** that includes an actuator **402**, **1204**. The actuator **1204** can be operable to receive, couple with, and/or control the payload **140**. In some examples, the actuator **1204** can be operable to receive and couple with a payload coupler **1210** which is operable to couple with a payload **140**. Accordingly, the modular component **1200** can have different configurations and the ability to be modified to couple with a variety of different payloads **140**.

[0057] In at least one example, the payload coupler **1210** can include a body **1212** with a coupling mechanism **1214** that is operable to couple with the actuator **1204**. The payload coupler **1210** can include one or more actuators **402**, **1216** operable to couple with the payload **140**. For example, the actuator **1216** can include a plurality of apertures which, as shown in FIG. 12C, one or more ties **1250** can be used to couple the payload **140** with the payload coupler **1210**. The ties **1250** can include rope, string, zip tie, etc. to wrap around the payload **140** and be received through the actuator **1216** to couple the payload **140** with the payload coupler **1210**.

[0058] FIG. 12D illustrates that the modular system **100** can include a plurality of interchangeable modular components **130** with different payloads **140**. As shown in FIG. 12D, the modular system **100** can include two modular components **130** coupled with drone payloads **1100** and one modular component **130**, **1200** coupled with a payload **140** such as a drop sensor, repeater, and/or munitions. The interchangeability of the modular components **130** to provide different payloads **140** increases the functionality and capabilities of the drone system **10**.

[0059] In at least one example, as illustrated in FIG. 13, each of the payloads **140** can include a tag operable to communicate with a controller **1300** (e.g., a tablet, a phone, a computer, etc.) such that the payload **140** is registered with the controller **1300** as it is being coupled with the modular component **130**. In at least one example, the payload **140** can be registered wirelessly. In at least one example, the tag can include an RFID tag, a QR code, etc. A user may need to swiftly configure the drone system **10** for various tasks and missions. By being able to quickly and easily register the payload **140**, the modular system **100** is quickly and easily set up for precise and secure control and/or tracking of the different capabilities now offered by the drone system **10**.

[0060] FIG. 14 illustrates that the drone system **10** and/or the modular system **100** can be communicatively coupled with a server **1404**, a controller **1400**, and/or a base control **1402**. The controller **1400** and/or the base control **1402** can be operable to be in communication with the chassis **110**, the control component **120**, the modular components **130**, the actuator **402**, and/or the payload **140**. The controller **1400** and/or the base control **1402** can be operable to control and/or receive data from the modular components **130** via the control component **120** (e.g., via the processor **1600**). In at least one example, the controller **1400** and/or the base control **1402** can be operable to control the payload **140** and/or receive data from the payload **140**. For example, the payload **140** may take pictures and/or detect signals (e.g., acoustic, light, etc.) and transmit the data to the controller **1400** and/or the base control **1402**. In at least one example, the controller **1400** and/or the base control **1402** can be operable to control the payload **140** (e.g., remotely) to explode

and/or propel the ballistics after being deployed. In some examples, the controller **1400** and/or the base control **1402** can be operable to control the flight and/or function(s) of the drone **20** and/or receive data from the drone **20**.

[0061] Accordingly, the modular system **100** can be remotely controlled by an operator and/or a team to synchronize and utilize the payloads **140**.

[0062] FIG. **15** illustrates an example user interface **1500** of the controller **1400** and/or the base control **1402**. The user interface **1500** can include, for example, a map **1502**, which can show the environment and/or the location of operators, the team, the payloads **140** and/or the drone systems **10**. In some examples, the user interface **1500** can show the visuals **1504** from camera payload(s) **140**, drone payload(s) **140**, and/or the drone(s) **20**. In some examples, the user interface **1500** can include additional settings **1506** which can provide different capabilities. For example, various sensors and data sources can collect real-time data which can be compiled, analyzed, and/or shown in the user interface **1500**. In some examples, the modular system **100** can be operable to operate in real-time, facilitating immediate sharing of information via the user interface **1500**. With this data, operators can analyze the data to make quick and informed decisions. In some examples, different entities can collaborate, allowing for coordinated responses to events.

[0063] FIG. **16** is a block diagram of an exemplary processor **1600**. Processor **1600** is configured to perform processing of data and communicate with the sensors, for example as illustrated in FIGS. **1A-15**. In operation, processor **1600** communicates with one or more of the components discussed herein and may also be configured to communication with remote devices/systems.

[0064] As shown, processor **1600** includes hardware and software components such as network interfaces **1610**, at least one processor **1620**, sensors **1660** and a memory **1640** interconnected by a system bus **1650**. Network interface(s) **1610** can include mechanical, electrical, and signaling circuitry for communicating data over communication links, which may include wired or wireless communication links. Network interfaces **1610** are configured to transmit and/or receive data using a variety of different communication protocols, as will be understood by those skilled in the art.

[0065] Processor **1620** represents a digital signal processor (e.g., a microprocessor, a microcontroller, or a fixed-logic processor, etc.) configured to execute instructions or logic to perform tasks in a wellbore environment. Processor **1620** may include a general purpose processor, special-purpose processor (where software instructions are incorporated into the processor), a state machine, application specific integrated circuit (ASIC), a programmable gate array (PGA) including a field PGA, an individual component, a distributed group of processors, and the like. Processor **1620** typically operates in conjunction with shared or dedicated hardware, including but not limited to, hardware capable of executing software and hardware. For example, processor **1620** may include elements or logic adapted to execute software programs and manipulate data structures **1645**, which may reside in memory **1640**.

[0066] Sensors **1660** typically operate in conjunction with processor **1620** to perform measurements, and can include special-purpose processors, detectors, transmitters, receivers, and the like. In this fashion, sensors **1660** may include hardware/software for generating, transmitting, receiving, detection, logging, and/or sampling magnetic fields, seismic activity, and/or acoustic waves, or other parameters.

[0067] Memory **1640** comprises a plurality of storage locations that are addressable by processor **1620** for storing software programs and data structures **1645** associated with the embodiments described herein. An operating system **1642**, portions of which may be typically resident in memory **1640** and executed by processor **1620**, functionally organizes the device by, inter alia, invoking operations in support of software processes and/or services **1644** executing on processor **1600**. These software processes and/or services **1644** may perform processing of data and communication with processor **1600**, as described herein. Note that while process/service **1644** is shown in centralized memory **1640**, some examples provide for these processes/services to be operated in a distributed computing network.

[0068] It will be apparent to those skilled in the art that other processor and memory types, including various computer-readable media, may be used to store and execute program instructions pertaining to the fluidic channel evaluation techniques described herein. Also, while the description illustrates various processes, it is expressly contemplated that various processes may be embodied as modules having portions of the process/service **1644** encoded thereon. In this fashion, the program modules may be encoded in one or more tangible computer readable storage media for execution, such as with fixed logic or programmable logic (e.g., software/computer instructions executed by a processor, and any processor may be a programmable processor, programmable digital logic such as field programmable gate arrays or an ASIC that comprises fixed digital logic. In general, any process logic may be embodied in processor **1620** or computer readable medium encoded with instructions for execution by processor **1620** that, when executed by the processor, are operable to cause the processor to perform the functions described herein.

[0069] The disclosures shown and described herein are only examples. Even though numerous characteristics and advantages of the present technology have been set forth in the foregoing description, together with details of the structure and function of the present disclosure, the disclosure is illustrative only, and changes may be made in the detail, especially in matters of shape, size and arrangement of the parts within the principles of the present disclosure to the full extent indicated by the broad general meaning of the terms used in the attached claims. It will therefore be appreciated that the examples described herein may be modified within the scope of the appended claims.

Claims

1. A modular system for drones, the modular system comprising: a chassis including a coupling mechanism operable to removably couple the chassis with a drone; a control component; a plurality of modular components operable to be interchangeably coupled with the control component, the plurality of modular components operable to be detachably coupled with a payload.
2. The modular system of claim 1, wherein the control component is operable to be detachably coupled with the chassis.
3. The modular system of claim 1, wherein the control component is operable to provide connectivity, power, and/or control of each of the plurality of modular components.
4. The modular system of claim 1, wherein each of the plurality of modular components includes one or more actuators operable to receive and control the payload.
5. The modular system of claim 4, wherein the one or more actuators includes one or more receiving portions operable to detachably couple with the payload.
6. The modular system of claim 5, wherein the one or more actuators extends vertically downward from a base of the modular component, wherein the actuator is operable to restrict horizontal movement of the payload received therein such that the payload deploys vertically downward.
7. The modular system of claim 1, wherein the payload includes one or more of the following: explosive charge, ballistic payload, sensor, antenna, radio, camera, speaker, light emitter, and/or drone.
8. The modular system of claim 1, further comprising a controller operable to be in communication with the chassis, the control component, the plurality of modular components, an actuator, and/or a payload.
9. The modular system of claim 8, wherein the controller is operable to control and/or receive data from the plurality of modular components via the control component.
10. The modular system of claim 8, wherein the controller is operable to control the payload and/or receive data from the payload.
11. The modular system of claim 8, wherein the controller is operable to control the payload to explode and/or propel the ballistics after being deployed.

- 12.** The modular system of claim 8, wherein the controller is operable to control the flight and/or function(s) of the drone and/or receive data from the drone.
- 13.** A drone system comprising: a drone; a modular system coupled with the drone, the modular system including: a chassis including a coupling mechanism operable to removably couple the chassis with the drone; a control component; a plurality of modular components operable to be interchangeably coupled with the control component, the plurality of modular components operable to be detachably coupled with a payload.
- 14.** The drone system of claim 13, wherein the control component is operable to provide connectivity, power, and/or control of each of the plurality of modular components.
- 15.** The drone system of claim 13, wherein each of the plurality of modular components includes an actuator operable to receive and control the payload.
- 16.** The drone system of claim 15, wherein the actuator includes one or more receiving portions operable to detachably couple with the payload.
- 17.** The drone system of claim 13, wherein the payload includes one or more of the following: explosive charge, ballistic payload, sensor, antenna, radio, camera, speaker, light emitter, and/or drone.
- 18.** The drone system of claim 13, further comprising a controller operable to be in communication with the chassis, the control component, the plurality of modular components, an actuator, and/or a payload.
- 19.** The drone system of claim 18, wherein the controller is operable to control and/or receive data from the plurality of modular components via the control component.
- 20.** The drone system of claim 13, wherein the chassis of the modular system is configured to be retrofit to couple with the drone.
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