Scientific Unmanned All-purpose Vehicle Engineering ("S.U.A.V.E.")
by Software Engineering Associates
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WHAT IS IT ?

S.U.A.V.E is a powerful, rules-based, integrating **SENSOR ENGINE**. Using miniature PC-104 hardware, SUAVE's software is designed to make embedded, remote data acquisition with diverse instruments easier than ever before. In simple terms, it's a **data acquisition system**, a **data logger**, a **telemetry system**, a **data router**, a **control system** and a **custom data processor** all in one. SUAVE can take a large group of sensors and their data and reduce them to any number of processed, custom outputs to the outside world. To accomplish this, SUAVE has a **built-in "interpreter" language** for processing data based on user-supplied equations to produce any custom output needed.

HOW CAN IT BE USED ?

SUAVE can be **embedded** anywhere - in any kind of manned or unmanned or remotely operated vehicle or on any kind of platform where +5VDC is available. Use it to simultaneously perform ANY combination of data acquisition, local sensor logging, data routing, uplinking/downlinking of raw or packetized sensor data, and processing and outputting of custom strings to exact specification. While doing any/all of those, it can also be used to interact with any sensor via serial or Ethernet link for control applications.

As a sensor engine **sub-system**, SUAVE can be linked to other systems for any purpose. So, for example, one or more of SUAVE's "sensors" can actually be connections to other systems via RF or dial-up modems, underwater acoustic modems, serial connections, and even Ethernet TCP/IP connections on a network.

As an intelligent, **networked sensor hub**, use it to automatically acquire / log / transmit data while interacting with it for control of unique devices connected to SUAVE.

As a **custom sensor processor**, use it to integrate a large group of sensors into one super sensor to the outside world, complete with engineering units obtained from truly raw data. Shape SUAVE's output into the exact string formats you need. At the same time, route needed data from one sensor to another to supply it what it needs.

MORE DETAIL...

S.U.A.V.E. runs on COTS PC-104 hardware attached to a maximum of twenty serial and twelve Ethernet-based sensors. Available in both Windows XP-E and DOS versions, It acts as a generalized data acquisition, logger and telemetry and control system for sensors mounted on an manned or unmanned, all-purpose vehicle or remote platform (aerial-, underwater- or ground-based). The program handles each sensor, its communication channel and the sensor's measurement data in a "blind" way, i.e., there is no explicit sensor knowledge built into SUAVE. It's activities are directed by an exact "parameter file" supplied by the user that tells SUAVE how to initialize and command each sensor as well as acquire and dispose of the data received from it. For serial sensors, SUAVE supports virtually any mix of RS-232, RS-422 and RS-485 hardware configurations. Ethernet sensors may be TCP/IP or UDP. Finally, the telemetry uplink/downlink may be Ethernet- or serial-based including support for RF, underwater acoustic and normal dial-up modems.

SUAVE's sensors are presumed to issue well-formed, ASCII or BINARY data sentences that are at least terminated by a known sequence of characters or are of constant length. ASCII sentences may be variable- or fixed-length containing one or more fixed- or variable-length (delimiter-separated) fields, or, in the case of BINARY data, fixed field content. Optionally, SUAVE can recognize a defined "header" (leader) field of any type. Sensors can be "periodic," i.e., offering data of their own at any interval, or, "commanded," i.e., interrogated to transmit data. In either case, each sensor may have its own unique initialization command file in ASCII or HEX format that is used to place the sensor into a desired state before sampling begins. Commanded sensors can each have their own, unique interrogation period. SUAVE even supports scheduling of repeated sensor events along with multiple date / time -based "appointments." Thus, SUAVE can perform specific tasks with any sensor during its stand-alone deployment.

SUAVE can treat any data field from any sensor as string- or numerically-formatted. When treated as string data, it maintains it's integrity verbatim and allows its output in any field position within the multiple **custom output definitions** supported by SUAVE. When treated numerically, SUAVE can operate on data fields as ASCII representations or IEEE-754 BINARY MSB- or LSB-first, 1, 2, 4 or 8-byte integer / floating point data with a rich set of mathematical and boolean operators (functions). In this way, SUAVE can produce engineering units even from BINARY data to exact user specifications. SUAVE also supports string operators.

SUAVE can be set to log any/all sensor data internally to automatically-named log files as well as communicate packetized sensor data uplink/downlink as well as form one or more "custom output" sentences comprised of any combination and sequence of formatted or unformatted, converted or as-delivered sensor data fields. These custom outputs can also be internally logged and/or communicated uplink/downlink. A custom output script specifies the exact field-by-field sequence of sensor data to be output. Literal strings in any field are supported along with date and time fields and CRC error bytes. Strings may be terminated with any character sequence. Custom output may be "periodic" or "round-up." The time-based, periodic form outputs the "last-received" variable strings while the round-up technique makes a best attempt to send data when the latest data is acquired for ALL sensors attached.

REMOTE CONTROL

The embedded, PC-104 based SUAVE program is accompanied by it's own Windows control program. **"SUAVE-Control"** allows complete setup, monitoring and interaction with any of SUAVE's remote sensors and important functions, and, the logging of verbatim and user-defined, custom data from SUAVE. Embedded SUAVE recognizes SUAVE-Control's remote commands for such things as starting and stopping sampling / logging / outputting operations, status queries, sensor reinitialization, and bi-directional, sensor-specific pass-through commanding. These capabilities are especially important during pre-deployment when sensor initialization and monitoring are crucial to proper operation. SUAVE-Control can also route incoming packet data to other destinations on a network by TCP or UDP protocols.

SUAVE COMMAND SET

Finally, the SUAVE "command set" for communicating with outside systems (including SUAVE-Control described above) is simple, succinct and straightforward. Users are encouraged to use SUAVE's documentation to build their own SUAVE-interacting applications.

(S.U.A.V.E specifications subject to change without notice. Windows is a trademark of Microsoft Corporation.)