

ESD assignment 2

by James Denning

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Back ground literature of Data Buoy.

What is a data buoy?

A Data buoy: floating platform that is dispatched in open sea that measures particular data in an marine environment by autonomous sensors which are sent and received to the central Data Acquisition system/unit to be processed for storage on either on-board the device, on an external device or transmitted. (Measurement)(Metrological)(1988)

Uses and Applications

The device is used for Meteorological and Oceanographic applications certain parameters of importance. Measuring surface temperature of the sea, water temperature at certain depths, wind direction and speed. The information is then transmitted in real-time accompanied with the buoys' position. Data is then received to create a numerical weather production model.

Therefore considered as automatic weather station or defined as a "Meteorological station"

Other applications for the data buoy are as follows:

Monitoring the ocean temperature is beneficial for fishing application. Such as locating certain species of fish which would both save time and fuel, monitoring stock, reproduction and ocean disturbances.

Data gathered from these devices can be collected to establish a Drift forecast model for search and rescue applications, by extracting data based on wind and ocean current parameters.

GPS

A GPS module is requested for tracking the costal position of the Device while severing marine parameters in open water conditions.

Specifications			
Device	GPS LS2003(2)	Neo-6/M/V	SAM-M8Q
Image	LS20033 		
Voltage conception	4.7 - 5.2 Volts	2.7-3.6 Volts	3.3V
Current consumption	34 mA	63 mA	29 mA
Up-date rate	1Hz – 10KHz	1 Hz	18 Hz
Number of channels	66 channel support	50 channel support	72 channel support
Antenna	MC-1513	U-box 6 Receiver	GNSS Receiver
Accuracy	Autonomous: 3 m SBAS: 2.5 m	(GPS): 2.5 m	Velocity Acc: 0.05m/s Heading Acc: 0.3 degrees
Pin count	5 Pins	24 Pins	14 Pins
Time-to-first-fix (TTFF)	Cold: 35s Hot: < 2s	Cold: 26s Hot: 1s	Cold: 26s Hot: 1s
Interface	RS232	UART, USB, SPI	UART, I2C, SPI
Additional Features	- Build-in micro battery to restore data. - LED indicator for GPS fix or no fix. (not available: LS20033).	- RTC CRYSTAL. - 3X Configure pins. - 1xtime-pulse. - An External interrupt/Wakeup. - GPS L1 Frequency (C/A code).	GPS is based on the U-box, allowing configuration for board rate, update rate, spoofing detection. On board battery provides power to RTC on chip reducing TTFF from Cold to Hot.

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Parameters	Interface	Signal type	Pin Count	Purpose
Wind speed.		Digital	D(1)	Determine speed of wind
Wind direction.		Analogue	A(1)	Determine direction of wind
Temperature.		Analogue	A(1)	Measure local temperature
Humidity.		Digital	D(1)	Measure local humidity
Light.		Analogue	A(1)	Measure density of light in local area.
Ultrasonic.		Digital	D(2)	Calculate approximate height of ocean wave.
LED.		digital	D(1)	Indicate device operation.
Start butt.		digital	D(1)	Connect/disconnect power supply

Table Main peripheral signal output.

Other peripherals	interface	description	Pin Count	purpose
USB port.	USB interface	Tx (transmit digital data) Rx (receive digital data)	D(2)	Connects to PC
SD card.	SPI	Serial Data Out (SDO) Serial Data In (SDI) Chip Select (CS) Serial Clock (SCK)	D(4)	Connection to external removable storage
GPS.	RS232 to UART		D(4)	Transmit device location.

Table other peripherals with interface

Connection type	Used by	Number of pins	Pin allocation
Analogue	Light sensor. Wind direction sensor. Temperature Sensor.	3 Pins	3 (A/D converters) Light Sensor x1 Wind direction Sensor x1 Temp. sensor x1
Digital (Excluding data transfer protocols)	LED. Start button. Wind speed sensor. Humidity sensor. Ultrasonic sensor.	6 Pins	1 (Power supply) 1 (Pin connection) 1 (External interrupt) 1 (Pin connection) 1 (CPP)
USB	USB module	2 Pins	2 (USB data ports)
SPI	SD card	4 Pins	4 (SPI connections)
UART	GPS modlue	4 Pins	4 (UART connections)

Specification	Value/Quantity
Analogue.	3 pins
Digital.	16 pins
Minimum pin count.	20 Pins
Clock speed.	16 KHz
Program memory.	28 – 125 KB
SRAM	500 (0.5) Bytes
Analogue to digital converter (A/D) (Minimum).	3
Timers/Counters (Minimum).	2
CPP	1
External interrupts (Minimum).	1
USB compatibility (Minimum)	1
Serial peripheral interface.	1
Universal asynchronous receiver transmitter	1

Table final evaluation

Microcontroller (PIC18F45K50)

The external peripherals have been selected to identify the pin count and signal output type to determine what microcontroller is acceptable for the devices applications.

Specification	
Flash (Program memory)	32k
SRAM	2048
PINS	44/40
I/O	36
A/D converters	25
Comparators	2
CCP/ECCP	1/1
MSSP	1
EUSART	1
Timers	2 (8-bit) / 2 (16-bit)
USB	confirmed

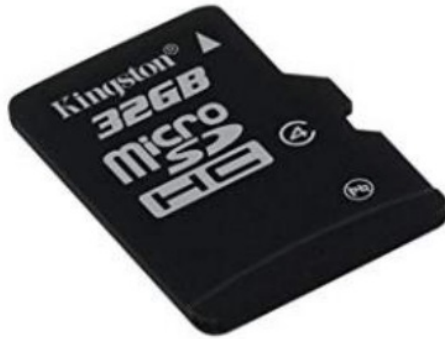
Data sampling rate

Factors	Component signal types (Analogue/Digital)	Sample rate	Number of Bytes
Temperature	1 – A (analogue input)	30 min	2
Wind speed	1 – D (Digital input)	30 min	1
Wind direction	1 – A (analogue input)	1 min	2
humidity	1 – D (Digital input)	30 min	1
Wave height	1 – D (Digital input)	30 min	1
Light density	1 – A (analogue input)	30 min	2

Factors	Number of Bytes (7 day-duration)	Justification
Temperature		
Wind speed		
Wind direction		
humidity		
Wave height		
Light density		
Total		

SD card.

The following information consists of a Micro-SD card and card connector which are the selected type of data storage device to act as external storage.



Title	Specification
Brand name:	Kingston
Item model number/Series:	SDC4/32GB
Batteries	1 Nonstandard battery.
From factor:	8-pin micro SD
RAM size:	32768 MB
Hard Drive:	32 GB
Voltage:	3.3 volts
Item weight:	9.07 g
Product dimensions	1.1 x 0.1 x 1.5 (cm)

SD card connector.



Title	Specification
Overview:	microSD card connector
Part number / Series:	5033981892
Style:	Push-Push
Pitch – Mating Interface:	1.10 mm
Height:	1.28 mm
Termination interface (style):	Surface mount.
Voltage (Maximum)	10 volts

ESD assignment 2

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

14/100

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GRADING FORM: SMU GENERIC_GJ

JAMES DENNING

13.50

RESEARCH-INFORMED LITERATURE



Literature revue is virtually non existant with no manufacturer information or comparison table. 10%

1.5

KNOWLEDGE AND UNDERSTANDING



design is non existant with no pcbs or schematics. 0%

ANALYSIS



Good selection of microcontroller. Good selection of sensors showing details for eash one with a table showing the selection of sensors to be chosen from with an image or illustration of each, but not the full set of sensors needed.No case selection. No connectors 30%

10.5

PRACTICAL APPLICATION AND DEP.



No costings, No attempt at future enhancements. 0%

SKILLS FOR PROFESSIONAL PRAC.



The report is unfinished aas is the assignment. No references. 15%

1.5