

Autonomous surf life saving device

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Abstract—Make boat that saves people

I. INTRODUCTION

II. SYSTEM OVERVIEW

III. COMMUNICATIONS

Communications between the SRB and the base station are done using XBee radios. By attaching a pair of XBee modules to the base station computer and the on-board Arduino, a virtual serial connection is effectively created between the two devices.

A. NMEA 0183 protocol

NMEA 0183 is a communications specification designed to create a standardised serial interface for GPS devices. Every NMEA 'sentence' begins with a \$ and ends with *CS\r\n, where CS is a two-digit hexadecimal checksum of the sentence.

A common NMEA sentence type is GPRMC, the GPS recommended minimum. GPRMC sentences are specified as follows: [?]

```
$GPRMC,<Time>,<Status>,<Lat>,<LatDir>,<Lon>,<LonDir>,<Speed>,<Angle>,<Date>,<MagVar>,<MagDir>*CS
```

Where:

<Time>	UTC timestamp in HHmmss format
<Status>	Status A=active, V=void
<Lat>	Latitude in ddmm.mmm format
<LatDir>	N or S hemisphere
<Lon>	Longitude in dddmm.mmm format
<LonDir>	E or W hemisphere
<Speed>	Ground speed in knots
<Angle>	Track angle in degrees from north
<Date>	Date in DDMMYY format
<MagVar>	Magnetic variation magnitude
<MagDir>	Magnetic variation direction

A NMEA sentence parser was written for the SRB to interpret messages from the on-board GPS and extract location information.

B. Proprietary NMEA sentences

Some advantages of using NMEA sentences are that they are standardised, human-readable, robust, and relatively simple to implement. Specified below is a set of custom NMEA sentence types was created for communication between the SRB and the base station.

1) *SRBSM - Status Message*: The SRBSM sentence is sent periodically by the SRB to update the base station with status information.

```
$SRBSM,<ID>,<State>,<Lat>,<Lon>,<Speed>,<Heading>,<BattV>,<FwdPower>,<TgtHeading>*CS
```

Where:

<ID>	ID of target SRB
<State>	0=disabled, 1=manual, 2=auto
<Lat>	Latitude in decimal degrees
<Lon>	Longitude in decimal degrees
<Speed>	Speed in metres per second
<Heading>	Compass heading in degrees CW from north
<BattV>	Current battery voltage
<FwdPower>	Forward power from -100 to 100
<TgtHeading>	Target heading in degrees CW from north

2) *SRBJS - Joystick*: The SRBJS sentence is sent by the base station for manual control of the SRB.

```
$SRBJS,<ID>,<FwdPower>,<TgtHeading>*CS
```

Where:

<ID>	ID of target SRB
<FwdPower>	Forward power from -100 to 100
<TgtHeading>	Target heading in degrees CW from north

REFERENCES

- [1] D. DePriest, "Nmea data," accessed November 2018. [Online]. Available: <https://www.gpsinformation.org/dale/nmea.htm>