

Design of a Low Cost Prototype of Automatic Identification System (AIS) Receiver

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The GMDSS system is the Global System of Maritime Distress and Safety. It is conformed by a variety of systems that allow communication and a fairly complete coverage on vessel tracking (*GMDSS equipment operation assessment standards*, CMSA, Mar, 2008). The AIS is part of this system and allows the user to acknowledge: the position, speed, heading and additional vessel information on real-time. Numerous commercial devices integrate the AIS. (Frank Lanier, “Feature Loaded High-end VHF’s”, ICOM 2012) These, allow users to access specific information once it has been correctly transmitted, received within a range of coverage and, transmitted into a general database (i.e. MarineTraffic). Nevertheless, the acquisition of a receiving device, which integrates features of interest, implies a considerable economic cost.

With this purpose, the design of a low cost AIS receiver that enables the analysis and viability of the system is proposed. To develop this low cost receiver, a complete system (as presented in Figure 1) must be designed. To do this, its different parts must be taken into consideration: an antenna that receives the signal, a radiofrequency stage that demodulates the signal to base band and the digital stage to perform an error control algorithm using a Cyclic Redundancy Code (CRC) to then, decode the AIS frames.

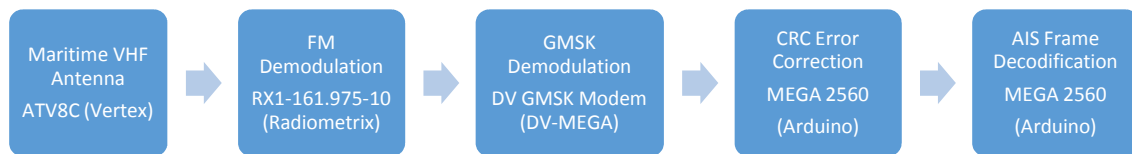


Figure 1: Signal processing before being displayed to the user.

The marine band VHF antenna chosen is a low-gain omnidirectional whip and adapted in the frequency band of the AIS. The FM demodulator chosen is the RX1-161.975-10 of Radiometrix. Once the signal is demodulated, it is demodulated once again in base band GMSK through a DV-MEGA modem plate (shield of Arduino) at a speed of 9600 bps. At last, the Microcontroller MEGA 2560 of Arduino is chosen to perform the actions related to error control (CRC) and decoding frames of AIS for the later transmission of decoded signals to a PC or a Raspberry PI.

The performance of the proposed low-cost AIS receiving hardware (< 100 Euros) complies with the expected reception performance under an academic or research environment. Indeed, the extension of its use will not only facilitate the access to information of great value but it will enable the building of computing systems and products. (Tichavska, M. and Tovar, B. Maritime Economists Conference, Norfolk, Virginia, 2014).

Furthermore, results may support applied and theoretical research in the areas of innovative system architectures for the future internet of things, transport systems, Geographical Information Systems, hardware sensors and low power computer, vessel and route efficiency, port optimization and others.