

UDC 004.042

SOFTWARE PACKAGE FOR RECEIVING AND PROCESSING DATA FROM A STRATOSPHERIC PROBE

© Pomel'nikov I.A., Pomel'nikova E.A.

Samara National Research University, Samara, Russian Federation

e-mail: vanidzepomelnikov@gmail.com

In 2019, in Samara University the student association «Space Gradient» was created. One of the main directions of the association is the development of a stratospheric probe based on the CanSat construction kit for launch at the summer session of the Air Engineering School.

The stratospheric probe (in combination with the receiving station) is a software and hardware complex. The hardware consists of a variety of chips, transistors, resistors, sensors, and other electronics components mounted on connected printed circuit boards. The software part of the complex is necessary to ensure the joint operation of all components of the device [2]. The data from the sensors installed on the probe are transmitted to the receiving device located on the ground, after that this data must be correctly received, recorded and sent for subsequent analysis processing.

In this regard, there is a need to develop a software package for receiving and processing data transmitted from the atmospheric probe. This task can be implemented by a software package, the key component of which is a terminal for receiving data and then sending it to programs for processing.

The data comes from the device to the receiving station connected to one of the PCs with the terminal enabled via the com-port [5]. To write data to the memory of the terminal program, a pointer to the com-port is created, after which the program goes into standby mode and captures all the data that gradually comes to the device. The received data is output to the terminal console, written to a backup file on the same PC.

If a connection error occurs via the com-port, the program displays a message about the type of the error and tries to reconnect. Of course, it is impossible to foresee all the errors that may occur during transmission [3], so actions are provided only when the most likely errors occur. After receiving and backup recording, the data must be sent to other programs for processing. This process is implemented using the software interface «socket». Data can be sent via a socket to either the same PC or a third-party computer, depending on which device the processing program is running on. When the connection through the socket is broken, the program immediately stops transmitting data through the interface, but continues to receive data through the com-port, all data received during the connection break is written to the buffer [4], from which, after the connection is restored, all data is sent through the socket. This implementation of the terminal makes it universal and makes it easier to create processing programs, freeing the developer from the need to create a structure for receiving data from the com-port in processing programs.

Data processing is a program that, based on the received data, visualizes the position of the probe in space. To do this, the program takes the input readings of the accelerometer, gyroscope and magnetometer. The data obtained by the program is processed by the Madgwick filter [1], after which it has the form of a matrix that can be used to graphically represent the position of the stratospheric probe.

At the moment, the development team is faced with the task of creating additional processing programs for analyzing the readings of other sensors.

References

1. Madgwick Sebastian O.H. An efficient orientation filter for inertial and inertial/magnetic sensor arrays. 2010.
2. Interfejsy apparatov VISH. URL: <http://roscansat.com/uchebnaya-chast/interfaces> (accessed: 30.01.2020).
3. Kody i znacheniya oshibok WinAPI. URL: <https://msbro.ru/index.php/archives/3578> (accessed: 09.05.2020).
4. Kol'cevoj bufer na S++ dlya MK. URL: <http://we.easyelectronics.ru/Soft/kolcevoy-bufer-na-s-dlya-mk.html> (accessed: 04.11.2020).
5. Rabota s com-portom na C++ v Windows. URL: <https://blablacode.ru/programmirovanie/392> (accessed: 16.02.2020).