Control of Information Stream for Group of UAVs in Conditions Lost Packages or Overloading

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EXECUTIVE SUMMARY

The chapter deals with the problem of controlling the flow of information coming from a group of unmanned air vehicles by radio channel. The inevitable data losses are compensated by repetition of lost packages or reconfiguration network. Modern methods control of data flow assumes using a mechanism ARQ based on the method sliding window. The consequence of these problems is a partial or total loss of its performance manifested in a decrease in the network's starting throughput. Part of the problem of restoring the network is solved by routing mechanisms, which lead to reconfiguration of the network due to the elimination of faulty nodes. Management of computer network overload is solved by well-known routing protocols such as OSPF, IS-IS, RIP, and others. In solving the problem, the representation of the output of individual nodes of the network using the "death and reproduce" scheme was used substantially. This scheme of network operation presupposes its representation by the Markov chain and the derivation of probabilistic characteristics by solving the Kolmogorov equations.

INTRODUCTION

Today the number of researchers takes attention to the collective management of unmanned machines based on radio remote control. It is the task of executing the works with the risk to human life, the need to fulfill the tasks in constraints of time, a long period carries out routine work. Application tasks of collective control include search and monitoring operations, extinguishing fires in large areas of the earth's surface and other (Dang & Horn, 2015 & Nathan et al, 2005), combat and antiterrorist operations (Karpenko, 2010). More recently, theoretical studies of the problems of application, challenges, and research problems related to the network use of UAV appeared (Mozaffari et al, 2018).

When managing the behavior of the group UAVs, it needs to transfer large amounts of information to the ground control station. To simplify the processing of information, the information is transmitted in small packets. The movement of aircraft, equipment failures, jamming of the radio signals, some data packets may be lost or, for example, there may be no confirmation of its receipt.

Some of the authors offer methods of the networks actions planning of UAVs, which based on discipline schedule, i.e. the order of processing of the transmitted packages (Kaur, 2011 & Niyato, 2005; Issariyakul, 2006; Bezruk et al, 2011; Gong et al, 2018). Nevertheless, an important task becomes developing algorithms compensate for lost packets or overloading. A natural approach to solving this problem is to resend lost packets to the point of reception and processing this information or overcoming this overloading. Then we have a network, and alone UAV the node of this network.

Network overload is one of the main problems that users of computer networks occasionally encounter. This problem causes a decrease in the bandwidth of the network, an increase in the passage time or loss of packets. It is this phenomenon that results in the termination of some network services, such as VoIP, interactive applications, chat, access to remote resources, and others. Lately, when there is an exponential growth of networks, this problem during their operation becomes the acuter.

One of the overload factors is excess buffering of the transmission channel (Gettys, 2011; Arefin & Amin, 2010). A buffer is required for data transmission over a communication line if the sender and the recipient have different processing pace. In this case, the buffer delays the transmission of packets at the time of acceptance and initial processing by the recipient. Filling the buffer leads to loss of packets transmitted. This phenomenon can be observed in routers, wireless access points, bridges, gateways, satellite devices.

Exclusion of overload is solved in several ways. You can achieve buffer overload by controlling queues and methods of prediction. Overload control methods control overload after it occurs, while prediction methods eliminate overload by controlling the transmission rate of the network on the network, enabling overloading and preventing it in typical "bottlenecks" of the network. The main tool of network operating systems for preventing overloads in Cisco is the use of algorithms of Weighted Random Early Detection (WRED) (Cisco, 2004).

In the duplex mode of switching ports control it is possible to implement a feedback mechanism that is introduced for Ethernet networks with IEEE 802.3x specification. The mechanism is implemented by introducing a sub-level of MAC level control, which introduces a time-stamping parameter for other nodes. The time is measured at 512-bit intervals of a specific Ethernet implementation, the range of possible stopping options is in the range $0 - 65535$. After the stop time is completed, the transmission is restored.

Overloading can be eliminated if bandwidth reservation is introduced based on binary methods. In this case, the user QoS applications provided a portion of the throughput of the channel, the other part is reserved for other users, which is carried out through the use of the logical connection. But this