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DRONES AS A NEW TECHNOLOGY TO SUPPORT LEARNING

The system of unmanned aerial vehicles is used in the process of education more often. Drones are slowly becoming a useful tool in online learning and information campaigns. Drones Image transfer capabilities allow teachers and students to be informed about important events, especially during remote learning. High resolution daytime cameras and thermal imaging allows to record video materials that can be used as instructional videos. Transfer image technology from a real flight enables the current information transfer to educational institutions and to students using computers with Internet network access. The aim of the article is to indicate useful unmanned systems functionalities in the educational process and to show examples in educational institutions.

Keywords: *drones; education; remote learning; pandemic; imaging.*

1. Introduction

Unmanned aerial vehicles - drones, are used for educational processes more often. Unmanned technology allows recording videos, taking photos and sending them directly to a specific unit or place. The possibility for reaching hard-to-reach places, the speed of the transmitted information and its reality is it's an advantage of this technology. Recorded video is very helpful during learning based on real phenomena or events. Materials of these types deliver to student's true demonstration of real event. The use of this type of video materials can be helpful in education in various areas of teaching. Creating various types of interactive educational content or simulations certainly increases the possibilities of the learning process, especially in the remote learning. Easy access to real learning content reduces costs and human potential usage. Organizing trips with students, e.g. to landscape parks, forests or other objects, can be replaced by creating real film animations or instructional videos.

Communication and fast information exchange allows for effective learning and quick knowledge assimilation by students. Innovativeness of educational systems should be adapted to the learning needs. In today's era of e-learning it is required to modernize student progress monitoring. This is possible by providing them virtual simulations and materials that are helping to develop their skills. Drones equipped in e.g.: daytime cameras, night vision cameras, various sensors, are able to support learning processes in many educational areas. Basic children education, safety education, environmental education or society education are some of the primary school subjects that can be supported by unmanned technology.

Another important are is the possibility to exchange instructional videos and materials made by drones between some educational institutions. This solution would help to

show negative and positive areas in some specific education fields. Good example in this case may be drone recording of physical education lessons. Lesson can be monitored by the supervisors in education institutions.

Drones can also perform surveillance and monitoring tasks. It is known that in every school or university it is many kinds of people. Unfortunately, besides teaching in these facilities, it is also risk of student's drug or alcohol addiction. Unmanned aerial vehicles systems could effectively minimize such situations, because potential negative behavior of teachers, students and guests could be recorded. These materials would be excellent evidence for educational institution managers and for the security service in the event of serious crimes or misdemeanors.

2. Examples of using drones in educational institutions

In the specialist literature we will find that in some European countries drones are already used in education. An example may be used fact that there is already implemented theoretical and practical training with the use of drones into the Energy and Transport School in Chełm. Students there improve their spatial programming skills. This project implemented by this educational institution is designated educate future drones pilots-operators of drones increasing knowledge in this area [1].

Another example is the increasing number of companies in Poland that perform drone training for schools and educational institutions. A special offer of training helping to achieve an European drone pilot certificate by this type of companies is dedicated specifically for schools. During these courses students have the opportunity to learn how to use dedicated drone software. Drones are increasingly used in many industries, e.g. in construction, environmental protection and marketing [2]. Unmanned aerial vehicles as new technologies are an inspiration to create a new working style by planning by controlling the conditions of the work environment. The use of drones in institutions increases work efficiency reduces costs and improves work safety [3]. This also applies to educational institutions where the use of unmanned technology may help with human potential manning, for example during educational institution monitoring. However an important element of the unmanned system is his spatial character. Students learning how to operate drone have the opportunity to learn about his operation, construction, software as well as related legal regulations with the performance for flights and airspace usage. All these areas may be in the interest of both kinds of students: humanists and science. New unmanned aerial vehicles constructions allow for a wide operational spectrum in education. There are many students UAV development projects and competitions at polish universities organized. Due to Internet sources, there is also UAV defense and security dedicated project competition organized in polish military universities this year. These projects include four categories: operational-reconnaissance, combat, loitering munitions and support [4]. Such projects are very popular and often contribute to the innovation development of innovation in this area.

Because of its specification unmanned aviation is useful for monitoring border areas as well as narrow streets in cities. In police operations, drones work very good during crowd control and road patrols. There are drones able to detect potentially dangerous objects and people. Performing tasks in the air, drones are able to detect suspicious behavior and automatically aware pilots-operators [5, p. 65]. This type of solution should also be successively used in educational institutions. Suspicious students or casual person's behavior who enter the educational institutions could be monitored by unmanned aviation. Drones using special sensors are able to detect fire hazards related to e.g. gas leaks or other substances in the vicinity of a school or university facility.

Unmanned aerial vehicles functions improve economic sector. They are currently used in the space, commercial, industrial, civil and security sectors. Drones are more often used in rescue operations and allow to recognize specific areas. Their functions are used to monitor the natural environment, forest areas, natural resources, fauna and flora, etc. Unmanned aviation successively supports mining, hydrotechnical, energy and telecommunications companies in collecting information and planning specific projects [6, p. 94]. According to the author of this article, the use of drones in education should be implemented gradually and should be divided for the specific tasks they would perform in a given educational institution. Schools and universities staff should be properly trained and familiarized with unmanned technology. The purchase of a drone should be adjusted to the needs of educational institution.

As A. Konert writes that the transport by unmanned aerial vehicles is becoming more and more popular. Transport companies, but also other entities, such as restaurants or private companies are interested in this type of service. However, advanced technology carries certain risks related to the privacy rights and legal property protection [7, p. 150–176].

Research conducted by R. Parczewski on the possibilities of using drones in a waste processing company shows the advantages of using unmanned technologies for monitoring. In the expert interview, the author focused on collecting opinions among the company's employees on drones and their possible use in the company's business activities. According to the company's employees, drones would be an excellent tool for monitoring rooms and informing the management staff about all kinds of inaccuracies on an ongoing basis. The interviews with the company's employees showed that during the processing of waste at each stage of production, constant monitoring and supervision are necessary [8]. It is similar in schools or educational institutions, monitoring is useful and needed in many areas. Supervision of the management staff of educational institutions over the performance of activities in relation to children and youth by teachers or tutors would be more effective. Drones could support and complement the current monitoring system in schools or educational institutions. Ordinary surveillance cameras are placed in permanent places and are visible to outsiders. Therefore, a variable monitoring system could affect the safety of students in schools or educational institutions.

Aviation is a kind of protective shield, effective observation gives a complete picture of the threat situation [9]. Unfortunately, there are also dangerous situations in schools or educational institutions.

As M. Szumiec writes, the level of school safety depends on the area of operation of a given school. In the school environment, a wide range of threats significantly contributes to a decrease in the sense of security of people staying in it, all educational institutions are obliged to take coordinated actions aimed at combating undesirable phenomena. Creating a safe environment in such facilities is a very complicated task. Management staff – as the main entity responsible for the security in this type of facilities. School principals and educators are obliged to actively cooperate with the Police, City Guard, Fire Brigade, etc. The key solution in the context of improving school safety is the meticulous development of an action plan, especially based on students' opinions about the threats existing in their environment [10].

Drones could effectively transmit the image directly to the indicated institutions or services. Fire or aggression hazards could be recorded by drones and directly transferred to the competent authorities. Drug trafficking and alcohol consumption are threats to which young people are susceptible due to their ignorance and immaturity. Therefore, schools and educational institutions should support and modernize monitoring systems. The implementation of unmanned systems in educational institutions where crowds of people are present every day seems to be a difficult task. The protection of personal data as well as the danger associated with the possible loss of control over the drone are areas that are worth analyzing in detail. Of course, with the observance of appropriate legal procedures, it is possible to do so.

Drones in schools are not a common occurrence. The functionalities of drones are not known among the management staff of educational institutions. According to the author, programs with the use of drones should be successively implemented in schools. Unmanned technology can also be useful in supporting teachers in the implementation of some curricular subjects. During the COVID-19 pandemic, many schools and educational institutions had problems with remote learning, if only because of the surprise. Drones in such situations could support the teaching system by providing educational materials in the form of films or photos using the Internet. Threats are often cyclical, but sometimes they come unexpectedly and can be dangerous to the school environment. The process of monitoring and recognizing threats should be adapted to the infrastructure of the educational institution.

So because of this the unmanned implementation in educational institutions where there is crowd is difficult task. Personal data protection and danger associated with the possible drone loss control risk should be analyzed carefully. It is possible to manage by appropriate legal procedures supervision.

3. Summary

Drones are already commonly used in many economic branches. Due to author opinion educational institutions are not fully prepared yet for the wide use of drones for monitoring or surveillance. At first staff should be trained and unmanned systems should be adapted educational institution requirements.

In Poland, every year drones are becoming more important in education. According to Internet sources students from Poland and Germany meet regularly during workshops organized as part of the project “Together for the borderland”. During this project drone construction and robotics knowledge is exchanged. Workshop trainers are presenting topics related to construction of drones, their operations etc. During training with drones trainers are teaching spatial thinking and hand-eye coordination. The workshops are very popular and are rated highly by the sci-

entific community [11]. Unmanned systems are changing through more and more new technologies and functionalities implemented. They can be used in many areas related to education.

According to Polish Police website there is often organized an educational campaign called “Safe way to school”. The aim of this action is to ensure safety in schools and educational institutions areas. Police officers use drones to check the pedestrian walk crossings markings and the correct parking of cars in the schools areas. Thera are also information campaigns organized about this. With the help of a specialized drone, police officers are able to monitor various events that may be important for the children during their way to school and back home [12].

This article shows that the unmanned aerial vehicle system is still developing and is used in some educational institutions. However, this technique must continuously adapt to conditions and hazards which are changing every year. Teachers and instructors must properly respond to threats and minimize them as quickly as possible. In these cases state authorities often are informed, e.g. the Police which proceed further investigation in specific case. Drones are excellent information platforms, so in case of threats they would be useful for visual playback of potential dangerous situation. We should remember that the student’s health and life is the most important value. The school as an institution should ensure an appropriate level of security and use modern technologies in this process.

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ДРОНИ ЯК НОВА ТЕХНОЛОГІЯ ДЛЯ ПІДТРИМКИ НАВЧАННЯ

Все частіше у процесі навчання використовується система безпілотних літальних апаратів (дронів). Безпілотники поступово стають корисним інструментом для онлайн-навчання та інформаційних кампаній. Можливості передавання зображень дронами дозволяють вчителям і учням отримувати інформацію про важливі події, особливо під час дистанційного навчання. Денні камери високої роздільної здатності та тепловізори дозволяють записувати відеоматеріали, які можна використовувати як навчальні відеоролики. Технологія передавання зображення з реального польоту дозволяє отримувати в режимі реального часу поточну інформацію навчальним закладам і студентам за допомогою комп'ютерів з доступом до мережі Інтернет. Метою статті є огляд корисних функціональних можливостей безпілотних систем у навчальному процесі та показ прикладів їх застосування у навчальних закладах.

Ключові слова: *дрони; освіта; дистанційне навчання; пандемія; зображення.*

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