Abstract
Although centuries have passed since the emergence of the concept of the Golden Ratio, it still has not lost its significance and wide range of applications. If the topic of research is devoted to the history of the emergence and development of the concept of the golden ratio, then one can talk and write about it endlessly, since the history of its occurrence is ancient. However, we are not going to talk about the history of the emergence and development of the concept of the golden ratio. We want to share our thoughts while talking about its wide range of applications. The article will not focus on a specific industry use, on some uses of the golden ratio. Since the general interest in the concept of the golden ratio led to this topic. Exploring this topic, we wanted to get answers to the question of what is the secret of the golden ratio. They found new applications for themselves, and made sure of the reliability of the results obtained, using measuring and calculation tools. The results obtained by us once again convinced us that we can find application for the golden ratio in our infinite environment.
Keywords: Fibonacci series, PHI number, golden ratio, secrets, applications.

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"NEW PIPE" AUTOMATED PIPE SYSTEMS

*[1]A.KANATNUR, [1]T.M.SEIDAZ
[1]Sh.Smagulov Specialized Physic-mathematics Lyceum boarding school
(Almaty Kazakhstan)
*Kanatnur0501@gmail.com, sejdaztalgat@gmail.com

Abstract
The research work is designed to ensure that the underground pipeline system does not suffer serious damage and losses due to explosion. For example, in the event of a megalopolis underground water pipeline bursting, the city residents will face a water shortage, and the city will flood. Subsequently, money and water consumption will increase to search for the place of the broken pipe, dig the roads where the pipe was installed and carry out repair work. And during the time spent on these repair measures, it is clear that there will be a large number of traffic jams for a long time in the cities where the roads will be closed. To completely solve these problems and ensure maximum cost reduction the project "NEW PIPE automated pipeline system" was created. As a result of the work carried out, we fully achieved our goal and achieved 80 percent correct results during system automation and operation. A water-sensing sensor emits a signal between 1 and 10 seconds to quickly locate a burst pipe.
Keywords: pipeline, energy, water, explosion, water sensor, solenoid, diode, GPS, solar panel, servo sensor, photoresistor, relay.

Introduction

A hollow object with a core, often ring-shaped in cross-section; cross-section is annular, hollow inside, mostly long products. The pipe is made of metal, ceramic, asbestos-cement, brick, reinforced concrete, wood, glass, rubber, plastic mass, etc. made of materials [Grudev A.P., 1994; Stepanenko I.P., 1967; Savel'ev I.V., 1977].

Pipeline bursts have various causes and consequences. Some types of pipes burst due to special damage, while others due to the durability of the pipe material. Pipeline explosions in big cities, that is, metropolis bring difficulties. There are still no easy ways to repair pipes in the Republic of Kazakhstan. That is why finding the wounded causes big difficulties and problems. A blasting pipe causes many residents to live without water and flood the streets. Due to the pipeline burst and its repair work, traffic jams may even occur on city streets. Our goal in creating New Pipe automated

systems is to simplify pipe repair work in urban areas, automate pipe routing, and prevent costs and risks in the event of pipe bursts. As well as the relevance of work is to quickly find the location of a pipe burst, making it easier for plumbers and reducing costs during repair work. Although, the importance of this project is related to reducing water and financial costs when repairing burst water pipes [Kayackas A.A., 1988].

Main body

As for the reason for the creation of the project, in 2017, 100 buildings were left without heat due to the explosion of a hot water pipe in the city of Almaty. In addition, three cars were completely submerged in water. And even though it took a month to restore the pipe burst, the people were not fully supplied with hot water even after the repair works. Even as we expand the scope of this New Pipe automated water pipeline project, we can bring it into international use. For example, the theft of oil and fuel products in Mexico is poorly controlled by the state and has gotten out of control, assuming a large scale. In 2017, oil theft costs totaled US$3 billion. The number of illegal cuts to fuel pipelines in Mexico exceeded 12,000 in the first ten months of 2018. As a result of this problem, the President of Mexico proposed in December 2018 a large-scale rescue plan for the oil sector in cooperation with the Mexican government and Pemex. The government's action plan covers the fuel crisis in several Mexican states and Mexico City until the end of 2018 [Mirrlees Rule, 2018].

To combat illegal logging, the authorities have stopped the transportation of fuel through several pipelines and switched to the delivery of fuel by main tanks. Troops were deployed to all oil refineries and strategic facilities of the transportation system. But such measures led to problems with the delivery of gasoline to gas stations.

The Tuxpan-Tula pipeline was owned by Mexico's state oil company Pemex. It serves to supply fuel to Central Mexico. Pemex said the pipeline system had been damaged ten times by illegal logging the three months before the disaster. The Tlahuelilpan pipeline explosion was an accident that occurred on January 18, 2019, near the town of Tlauelpan in the municipality of Tlauelpan, Hidalgo State, Mexico. Because of cracked pipeline systems, 114 people died, and 33 people were injured. Mexican authorities have blamed fuel thieves for illegally tapping the pipeline, which led to a massive fire and dangerous explosion. Because of this problem, we believe that we can find a rational solution by proposing an automated pipeline system project [Imagen Noticias, 2019] (figure 1, 2).

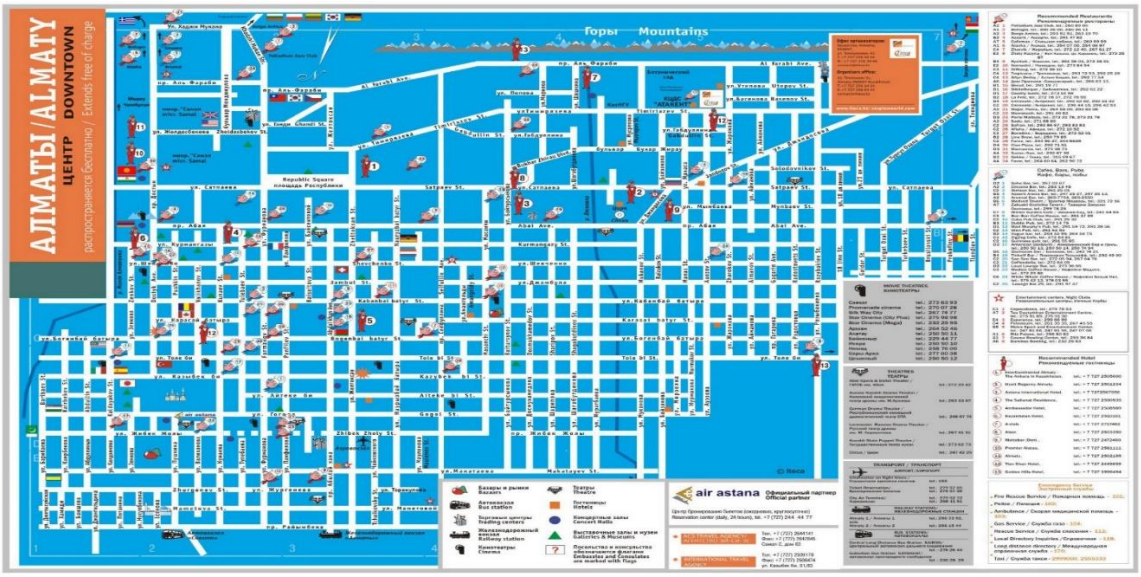

Figure 1. Underground pipeline system of Almaty city

Methods

The NEW PIPE automated pipe systems project's design method is directly related to electronics and

mechanics. During the development of the project, research was carried out on the hot water pipe explosion in Almaty and the map of water pipes in Almaty. In the course of the research, we noticed that the water pipe systems of Almaty city are very dense, and the consequences and danger of an explosion are serious. In this regard, we can place the research object every 10 meters of water pipes. [Bocharov L.N., 1979].

Figure 2. Pipeline explosion in Almaty city

Although if we talk about how the main part of the research work and the process of making it and the research work done on it, the model includes a water sensor, wire, Arduino Uno, power supply, sound sensor, diodes, solar panels, batteries, button, servo sensor, photoresistor and pipes and water solenoid is located. If we divide this equipment into groups according to their functions, the water detector sensor, wire power, diode, and sound sensor are used to inform the repairmen about the pipe burst at the moment of bursting of water pipes. For example, if a water pipe bursts, water will necessarily flow to the ground or along the pipe, and when it hits the water sensor, the sound sensor will automatically sound the alarm and light up the diode [Chetvertkov I.I., 1991; Aksenov A.I., 1995; Dulin V.N., 1978].

The second group consists of batteries, a button, a solar panel, a servo sensor, and a photoresistor. They provide energy to the automated system we interact with. That is, the solar panels receive energy from the sun and transfer it to the battery, through which the battery spends energy on the automated system, that is, the operation of water sensors. And the servo sensor and photoresistor, being placed on the ground together with the solar panel, turn the solar panel in the direction of the sun and ensure that it receives full energy throughout the day. In this scheme, the function of the servo is to rotate the solar panel, and the function of the photoresistor is to find the direction of sunlight and provide information to the servo sensor [Zherebcov I.P., 1990] (figure 3). Full system control in layout. How does the valve (water solenoid) turn on automatically?

In the creation of miniature models of automated pipe systems, relays were used to fully automate the system and automatically turn on or off the water through the pipe in the event of a water pipe burst. A relay is a type of electrical switch. It is made up of an input terminal for a single or more control signal and an operational contact terminal. The switch may contain an unlimited number of contacts in various contact types, such as make contacts, break contacts or combinations of the two. A relay (automated switch) was added to the water solenoid and signaling systems (water sensor, sound sensor, LED) to be included in the pipeline system layout. The purpose of connecting the relay is to control the water solenoid through the Arduino so that the water in the pipe system is turned on and off automatically without human intervention. As mentioned above, the relay is fully integrated into the alarm system. As a result, the relay automatically turns off the valve as soon as the water-

sensing sensor provides information about the presence of water. With this, we can make the water not flow from the pipe.

Figure 3. Solar panels for street lights

A water solenoid acts as a valve in a piping system. A coil is wound inside the water electromagnet, and inside the coil is a solenoid valve handle. If the coil is connected, the magnetic valve ensures that water does not flow through the pipe when the handle is pulled, or the water sensor receives information. When the water sensor receives information about the presence of moisture in the water, the water electromagnet closes automatically. With this, you can consider ways to regulate and reduce water consumption [Frolov V.V., 1998].

Results

As mentioned above, Almaty's urban water supply system is too dense, and the city area is very large. If an explosion occurs, it is obvious, that due to the density of the pipes, it will be difficult to immediately find the part of the pipe where the explosion occurred. And the GPS sensor can help us at this moment. The GPS sensor receives information from the water sensor and contributes to immediately finding the area where the water pipe has burst.

Next, the rest of the equipment list includes a pipe and a water solenoid. We place a water solenoid at every bend and pipe intersection, and the solenoid also works in one system, working together with the mechanisms mentioned above. For example, let's say there is a burst water pipe, and at this moment information comes to the sound sensor and GPS immediately from the water sensor. Then the water sensor sends the signal to the first water solenoid located in the direction of the water flow. With the help of this signal the water solenoid in front of the way of the explosion is automatically closed for a certain time and prevents water from passing through the place of the burst water pipe. With this scheme, we can reduce the risk of water loss and pipe burst disasters. As a result, the water from the explosion site will not flood the city residents and cars, the roads will be closed and traffic jams will not occur in the city [Frolov V.V., 1998].

Before completing the NEW PIPE automated water pipe system, the most important part of the work is to calculate the power supply to the system, and the power sources from the batteries after connecting the circuits and each sensor. After the main part of the automated system was ready, I connected it to the power source and concluded that the system was working properly and not working [figure 4].

As a result, the water sensor in the system automatically activates when it senses the humidity of the liquid and sends information to another sound sensor, diode, and water electromagnet, adjusting the principle of its switching. And the solar panel in the model of my research work could not provide enough power due to the small surface area for the complete system circuit where the water sensor located.

As a result of this problem, I realized the need to make the surface area of the solar panels located on the roadside more convenient for energy transfer in the future. In addition, it found that the strength of the water flow along the pipeline plays a significant role in the perfect operation of the water solenoid valves located at the intersection of the pipes. As a result of this problem, we can observe the water solenoid by connecting it to a surface water pipe for a practical test. In addition, we can conclude that the water solenoid will work as planned without any problems since there is a continuous flow of water in the underground water pipeline system [Kushekov A.U., 1996].

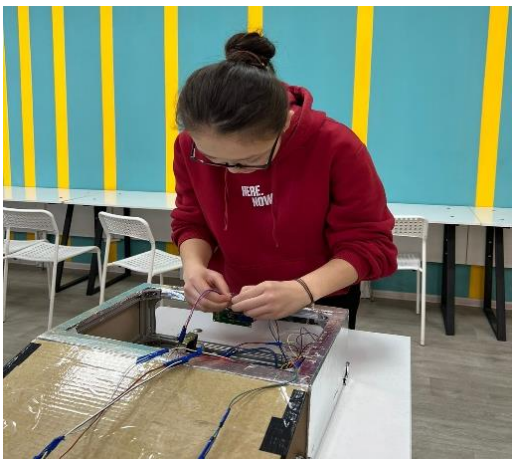

Figure 4. New pipe automated water pipe system layout

Discussion

I analyzed the results of my work by comparing it with the project "SmartPipes: Smart Wireless Sensor Networks for Leak Detection in Water Pipelines". This project is a piping system project by the School of Civil Engineering, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK, and the School of Mechanical Engineering, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK. According to the main idea of the research project "Asset monitoring, specifically, infrastructure monitoring such as water distribution pipelines is becoming increasingly critical for utility owners who face new challenges due to an aging network. In the UK alone, between 2009 and 2010, approximately 3281 megaliters (106) of water were wasted due to failure or leaks in water pipelines. Various techniques can be used for the monitoring of water distribution networks. This paper presents the design, development, and testing of a smart wireless sensor network for leak detection in water pipelines, based on the measurement of relative indirect pressure changes in plastic pipes" [Ali M. Sadeghioon, 2014].

The similarity between the problem I'm identifying and the problem I'm dealing with is a burst pipe and a water leak. According to this research project, the problem of water leakage in the detector sensor was solved using a pressure sensor. In this regard, soil temperature and water flow pressure, and water temperature play an important role in the considered problem. In addition, using a wireless sensor node as the main tool of the project, the main system was controlled and monitored remotely via a wireless network. In order to fully evaluate the performance of the nodes and sensors in real life conditions they were deployed on a leak testing facility. Each node was connected to two temperature sensors and one FSR based pressure sensor. One of the temperature sensors was attached directly to the pipe to measure the pipe wall temperature while the other temperature sensor was located approximately 30 cm away from the pipe in order to measure the soil temperature surrounding the pipe. Each sensor node measured all three parameters every 1,027 s and transmitted the values to the mother node located in a building close to the nodes. These data were then logged locally and shared via the internet with other devices [Ali M. Sadeghioon, 2014].

And in my version of solving the problem of pipe competition, a water sensor is placed on the edge of the pipes at a distance of every 10-15 meters. If the water pipe bursts, the water sensor will send a

signal and the water solenoid will be turned off. There is no need to measure the water pressure as the water pressure is measured according to the suitability of the water pipes. In this case, it is necessary not to supply water to the broken pipe by placing a dam on the water pipe so that there is not a lot of water loss.

Conclusion

In short, in the course of these works, efforts were made to reduce losses and damage from water pipes and to effectively use inexhaustible energy sources (solar energy). In addition, during the work, I calculated the cost of creating a project layout and the financial amount required for the future installation of one unit of the target project (Table 1). Due to the results and benefits of the project idea, it was presented to the leaders of the Almaty city pipe system construction complex. As a result, depending on the proposal, the project will be tested in the future in the construction of a new pipeline system in the Almaty region.

Table 1

Water pipe installation estimate (from one point)

№	Basic equipments	Number of items	Price for 1 piece, tenge	Total price, tenge
1	PVC	2	650	1300
2	Solar panel	1	3500	3500
3	Sensors	4	5000	21000
4	Water solenoid	1	6500	6500
5	GPS sensor	1	6000	6000
	Total			38 300

The automation and control of these water pipes provide for emergencies and is affordable to the Kazakhstani user and whole world pipeline systems of water or oil (the cost of the system is 38,300 tenge (142.06 manat), that is, its price is not higher than the average salary of a Kazakhstan), and the economic efficiency of using the system. 10,000 tenge (37.09 manat), the repayment term of this facility is two years.

I believe that thanks to the results of the project and its advantages, we will not only find a solution to the large-scale problems that we face in our daily life but also reduce the number of expenses and help save the economy and finances. In addition, I believe that we can ensure the safety of people's lives.

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"New pipe" автоматтандырылған су құбырлар жүйесі

*[1]*А.Қанатнұр, [1]Т.М.Сейдаз*
[1]Ш.Смағұлов атындағы мамандандырылған физика-математика мектеп-интернаты (Алматы, Қазақстан)

Аңдатпа
Ғылыми-зерттеу жұмыстары жер асты құбырлары жүйесінің жарылыс салдарынан елеулі зақымданулар мен шығындарға ұшырамауын қамтамасыз етуге арналған. Мәселен, мегаполистің жер асты су құбыры жарылған жағдайда қала тұрғындары су тапшылығына ұшырап, қаланы су басады. Кейін сынған құбырдың орнын іздеп, құбыр орнатылған жолдарды қазып, жөндеу жұмыстарын жүргізуге ақша мен су шығыны артады. Ал осы жөндеу шараларына жұмсалған уақыт ішінде жолдар жабылатын қалаларда ұзақ уақытқа көлік кептелісі көп болатыны анық. Осы мәселелерді толығымен шешу және шығындарды барынша азайту үшін «NEW PIPE автоматтандырылған құбыр жүйесі» жобасы құрылды. Жүргізілген жұмыстардың нәтижесінде біз өз мақсатымызға толық жетіп, жүйені автоматтандыру және пайдалану кезінде 80 пайыз дұрыс нәтижелерге қол жеткіздік. Суды сезіну сенсоры жарылған құбырды жылдам анықтау үшін 1-10 секунд аралығында сигнал береді.
Түйін сөздер: құбыр, энергия, су, жарылыс, су датчигі, электромагнит, диод, GPS, күн батареясы, серводатчик, фоторезистор, реле.

Автоматизированная водопроводная система "New pipe"

[1]А.Канатнур, [1]Т.М.Сейдаз
[1]Специализированный физико-математический лицей-интернат имени Ш.Смагулова (Алматы, Казахстан)

Аннотация
Исследовательская работа направлена на то, чтобы система подземных трубопроводов не понесла значительных повреждений и потерь в результате взрыва. Например, если прорвется подземный водопровод мегаполиса, жители города будут испытывать нехватку воды, и город будет затоплен. Позже поиск места пробитой трубы, копание дорог, где установлена труба, и проведение ремонтных работ увеличат стоимость денег и воды. И за время, затраченное на эти ремонтные мероприятия, понятно, что в городах, где будут закрыты дороги, пробки будут еще долго. Для полного решения этих задач и минимизации затрат был создан проект «Автоматизированная трубопроводная система NEW PIPE». В результате работы мы полностью достигли поставленной цели и добились 80 процентов правильных результатов при автоматизации и эксплуатации системы. Датчик воды подает сигнал тревоги в течение 1-10 секунд, чтобы быстро обнаружить прорыв трубы.
Ключевые слова: труба, энергия, вода, взрыв, датчик воды, электромагнит, диод, GPS, солнечная батарея, следящий датчик, фоторезистор, реле.

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