Improving the efficiency of the use of ICT to radically reduce losses in the event of emergencies

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Problems of the day

1. The paradigm of nonzero risk.
2. ineffective systems of management in Emergency situation for human rescue.
3. Inability to control in some Emergency situations, for example earthquake.
before Emergency situation
during Emergency situation
after Emergency situation
forecasting
general warning
coordination of actions for rescuers

$T = Tk - t0 > 10 \text{ min}$

$T = Tk - t0 = 0$
Content

1. The need to find new solutions to radically improve the predicative capacity of existing processes for global monitoring systems,
2. The need for multidisciplinary research,
3. The new paradigm for personalized management of disaster (9 TELMIN APEC Declaration -2012),
4. The possibility of using IoT (GeO IoT) for the monitoring and management of natural disaster
1. The need to find new solutions …

- Every year, emergency situations of natural character (such as earthquakes and floods) are sources of excessively large material and human losses in different parts of the Earth. In this case the loss is equally high for both developed and developing countries.

- Therefore, the international community and individual countries pay great attention to the development and operation of the global processes of monitoring systems. Therefore, the international community and individual countries pay great attention to the development and operation of the global processes of monitoring systems.
1. The need to find new solutions ...

However, the measures taken can not yet improve the predictive capacity of existing systems to the economic value and each time another disaster is a catastrophic surprise for both the administration and for the entire population of the area in which emergency happened.

It should be noted that natural disaster is often accompanied by a man-made disaster. Particularly large losses - in large cities.
1. The need to find new solutions ...

It is necessary to take into account another cause large losses for countries that are exposed to shocks disasters of natural origin. The fact that the efforts of States in the development of tools for monitoring and prevention of emergency situations arise are often ineffective as citizens who find themselves in the emergency area, and even warnings about emergencies become helpless, immediately forget all the instructions and as a result, are often the victims of these emergencies.

This phenomenon, as a rule, the further analysis of disaster qualifies as a "human factor". Moreover, we emphasize again, this phenomenon is equally characteristic of both developed and developing countries.

Suffice it to recall the recent tragic events in Japan, the US, China, Russia, Republic of Korea, Guatemala, Pakistan, Taiwan and others.
1. The need to find new solutions …

Considering

• rapid urbanization (UN predicts about 78% of the world's population (6.3 billion people) will live in cities by 2050)
• and the huge costs that are spent in the world on the science of the earth, the development of systems (including ICT) monitoring of global processes,
• heavy costs of Emergency Situations Ministry,

Humanity can no longer put up with the poor results obtained and urgently requires the search for new solutions.
2. The need for multidisciplinary research,

Background possible solutions:

• The search for methods of detection signals, harbingers of global processes.

• Research the impact of global processes on living and inert objects of nature.

• Development of models of a particular disaster at a particular facility.

• Development of ICT - IoT and GeO IoT.
2. The need for multidisciplinary research.

Combining the achievements of various scientific disciplines through a common network with the use of IoT (Geo IoT) as a signal harbingers of disaster indicators to radically improve the predictive potential of global processes of monitoring systems.
3. The new paradigm for personalized management of disaster (9 TELMIN Declaration -2012)

Implementation of a new paradigm of personalized control the behavior of people who find themselves at the facility in the emergency area, it was possible when using:

- IoT (GeO IoT) as sensors object environment,
- Intelligent subscriber units to communicate with sensors IoT (GeO IoT), located in this facility,
- Development of models of specific emergency situations at the facility, created divisions of Emergency Situations Ministry.
3. The new paradigm for personalized management of disaster (9 TELMIN Declaration -2012)

- Organization of independent personal evacuation,
- Panic prevention,
- Help in the organization of rescue operations saving up to 90% of the people before the start of a catastrophic disaster phase
An application able to interact with sensor networks of the different buildings is installed on mobile phones.

- The majority of modern phones is equipped with this application.
- The subscriber can make a data entry about his personal features for them to be considered when he needs to find the most secure exit from the location.
- Location and activities data activities when probable menaces may occur upload automatically, when the subscriber enters into the location.

Proposed solution

- Sensor network
- Mobile application
- Fixed application
- Control complex
When the subscriber is leaving the location, his mobile phone is continuously interacting with sensors in the location to updating the secure exit.
4. The possibility of using IoT (GeO IoT) for the monitoring and management of natural disaster.

In contrast to existing security systems running before and / or after a disaster, the implementation of a new paradigm – system of personalized control the behavior of people provides dynamic personalized management of evacuation of people directly during emergencies.

But the system of individualized management of saving people when disaster occurs, powerless, if the time interval between the beginning of emergency and the start of its catastrophic phase approaches zero. And this value is typical for such devastating disasters such as earthquakes, which bring the greatest human and material losses.
### Emergency phases

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_0$</td>
<td>Beginning of emergency - Emergency detection by sensors</td>
</tr>
<tr>
<td>$t_1$</td>
<td>Moment of mass notification</td>
</tr>
<tr>
<td>$t_2$</td>
<td>Moment awareness of the dangers</td>
</tr>
<tr>
<td>$t_3$</td>
<td>Start of the catastrophic phase</td>
</tr>
<tr>
<td>$t_4$</td>
<td>End of the catastrophic phase</td>
</tr>
<tr>
<td>$t_5$</td>
<td>Emergency services start rescue and disaster relief work</td>
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</tbody>
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**Existing systems**

- Starting rescue management of personnel and people with disabilities
- Control residents and non-residents rescue
- Self-evacuation
- Transmission of the information about situation details to the rescuers
4. The possibility of using IoT (GeO IoT) for the monitoring and management of natural disaster.

Professor Lyubushin A.A.- Head of the Laboratory of the Institute of Physics of the Earth RAS. O. Schmidt in his work suggested that the detection of signals harbingers can be reliably carried out (and thus increase the predictive capacity), if we compare the real-time synchronization of sensor readings by different physical nature, located close to the sensors of existing monitoring systems, sensors with readings of these systems.

We assumed that for this purpose the best suited IoT (GeO IoT). The basic idea of the use of sensors of other physical nature (IoT, GeO IoT) for synchronization is that the signals -predvestniki accidents are a common modulating signal for sensors of different physical nature.
4. The possibility of using IoT (GeO IoT) for the monitoring and management of natural disaster.

The sensors IoT (GeO IoT) may be used any living (including humans) and objects stagnant nature. In the basic sciences have accumulated a lot of the results of studies of the influence of global processes on living and inert objects that can be used to search for GeO IoT, the most sensitive to certain types of signals harbingers.
4. The possibility of using IoT (GeO IoT) for the monitoring and management of natural disaster.

Given the fact that among the objects of nature there is an enormous amount of objects that exhibit increased sensitivity to certain changes in the environment settings, there is a high probability of finding among them suitable natural sensors. The choice of such sensors can be carried out only with the help of scientists who study the impact of changes in the parameters of the external environment on the parameters of natural objects. Since the early stages of a global disaster of natural or man-made origin may occur at the same time quite a lot signals harbingers emergencies of varying intensity, it is therefore proposed to use the joint IoT (GeO IoT) sensor (i.e. panel, consisting of different types of natural sensors IoT (GeO IoT), some of which under real circumstances may have more sensitive data signals harbingers than the other) to complement the sensors, the existing monitoring systems for the global processes of natural origin.
Creating a common platform of interaction of all disaster management systems in the APEC region

Existing (monitoring, notification, ...) disaster management systems in APEC region

Common disaster management platform of APEC region

E-Health ICT systems

ICT systems for disabled people

Customized safety ICT system
Application of the common platform of interaction of all disaster management systems in the APEC region during disasters

Existing (monitoring, notification, ...) disaster management systems in APEC region

Common disaster management platform of APEC region

Customized safety ICT system

E-Health ICT systems

ICT systems for disabled people

- Alarm: You have 10 minutes to leave the building!
This inclusion fragments of global network in IoT in existing monitoring systems for natural and man-made processes will allow to solve two pressing problems today:

• improve predictive capacity (i.e., to predict disaster for a few hours and to specify the range of this ES) of these systems that will better prepare existing infrastructure habitat for the upcoming emergency situations and thus reduce material loss,

• to increase the efficiency of object systems of individualized control the behavior of people caught in the emergency area.
Modern ICT can be significantly reduce human and material losses from disaster.
Thanks for your attention!

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