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Research Article

# To the 90th anniversary of professor Telman A. Aliev

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**ABSTRACT**

The article briefly describes scientific and pedagogical achievements of Professor Telman Abbas Aliev, Doctor of Technical Sciences, and highlights the key historic events of his life and academic career, his bibliography: books, articles and conference papers.
T.A. Aliev has shown that the traditional conditions of “absence of correlation between the useful signal and the noise” in the analysis of noisy signals at the beginning of emergency state of objects are not fulfilled. To ensure accident-free operation of control objects, it is necessary to create a technology for analyzing noisy signals in the presence of correlation between the useful signal and the noise, which occurs at the beginning of accidents. T.A. Aliev has proposed technologies that allow to ensure accident-free operation of control objects to a significantly larger extent. To validate the effectiveness of these results, experimental studies were conducted for many years at compressor stations, oil fields, drilling rigs, offshore platforms, in transportation, medicine, construction and seismology. These results have been outlined in numerous articles and in three monographs published by Springer.

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## INTRODUCTION

On May 2, 2025, the outstanding computer scientist, Advisor to the Azerbaijan National Academy of Sciences and Head of the Information Technologies and Systems Department of Azerbaijan University of Architecture and Construction, DSc in Engineering, Professor, Academician Telman A. Aliev celebrated his 90th birthday. The article gives a brief summary of scientific and pedagogical achievements of T.A. Aliev.

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### Biography

Telman Abbas Aliev was born on May 2, 1935, in Goranboy, Azerbaijan. He attended the Delimamedli village secondary school in Goranboy from 1943 to 1950, and the Azizbekov village secondary school from 1950 to 1953 (Fig. 1). After graduating the M. Azizbekov Azerbaijan Industrial Institute (1953 to 1958), he started working at the Computing Centre, first as a technician, later as engineer and chief engineer until starting postgraduate studies in 1962 (Fig. 2) and (Fig. 3).

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**Figure 1.** Baku. 1st year. 1953.

**Figure 2.** Work experience internship after completing the 3rd year. Leningrad. 1956.

**Figure 3.** Working on diploma in Lviv. 1957.

**Figure 4.** BESM-2 mainframe computer.

Amirov A., Aliev T., Gasimov E. 1960

Telman Aliev founded and, until 1976, headed the Laboratory of Electronic Computing Machines, which was established in Azerbaijan between 1958 and 1960 and played a crucial role in developing computer science in the country (Fig. 4.). He sat on the Board of the Computer Science and Computer Engineering Society, as well as on the computer science, computer engineering and cybernetics expert council of the USSR. Telman Aliev has authored several key works at the intersection of computer science, cybernetics, and physics.

In 1966, Telman Aliev successfully defended his Candidate's dissertation, which was overseen by Prof. V.V. Solodovnikov at Bauman Moscow State Technical University (Fig. 5). He went on to complete his DSc dissertation in 1977. He was elected a Corresponding Member of the Azerbaijan National Academy of Sciences (ANAS) in 1983 and a Full Member of ANAS in 2001.

Telman Aliev became Deputy Director at the Institute of Cybernetics in 1982, honorary head of department of the AzUAC in 1984. The title of Professor was awarded to Telman Aliev in 1985. He held the position of the Director of the Institute of Control Systems (formerly the Institute of Cybernetics) from 1988 to 2020.

From 1993 to 1998, he chaired the Expert Council of the Higher Attestation Commission under the President of

**Figure 5.** At International Symposium in Veliky Novgorod. Prof. V.V.Solodovnikov, Prof. T.A. Aliev, Prof. L.T. Kuzin.

**Figure 7.** Prof. T.A. Aliev

Azerbaijan, became a UNESCO computer science expert in 1994.

From 1997 to 2001, Prof. Aliev served as the Academician Secretary of the Division of Physical, Mathematical and Technical Sciences (PMTS) of ANAS. He was on the Presidium of the Higher Attestation Commission from 2008 to 2015.

More recently, Prof. Aliev has led the introduction of a new RNM system at 500 facilities of the Bibiheybat NGDU. This system enables remote diagnosis and management of downhole oil extraction equipment, effectively doubling their profitability (Fig. 6).

Since 2013, Telman Aliev is on the editorial board of the Russian (Moscow) *Mekhatronika, Avtomatika, Upravlenie* journal and the Ukrainian (Kyiv) *Problems of Control and Informatics* journal.

In 1991, T.A. Aliev was awarded the Keldysh Medal for his achievements in scientific and scientific-public work, in 2004 the Shohrat Order. He was awarded the title of Honorary Scientist of the Republic of Azerbaijan in 2009, the Nasreddin Tusi Prize of the ANAS in 2015, and the Academician Azad Mirzajanzade International Silver Medal in 2018. He chaired the dissertation council of the Institute of Control Systems. In 2024, Prof. Aliev received the "100th Anniversary of Heydar Aliev (1923-2023)" jubilee medal (Fig. 7).

Telman Aliev has authored 594 publications, including many in journals indexed by the Web of Science (WoS), and 3 monographs at Springer. The most recent of them, *Noise Control of the Beginning and Development Dynamics of Accidents* (2019, 201 p.), was included in the "Springer Link Engineering" e-book collection by Springer Publishing House in 2019 and was published as part of it. In this

**Figure 6.** Implementation of the oil well monitoring system based on Noise technology at the "Shirvan Oil" oil field.

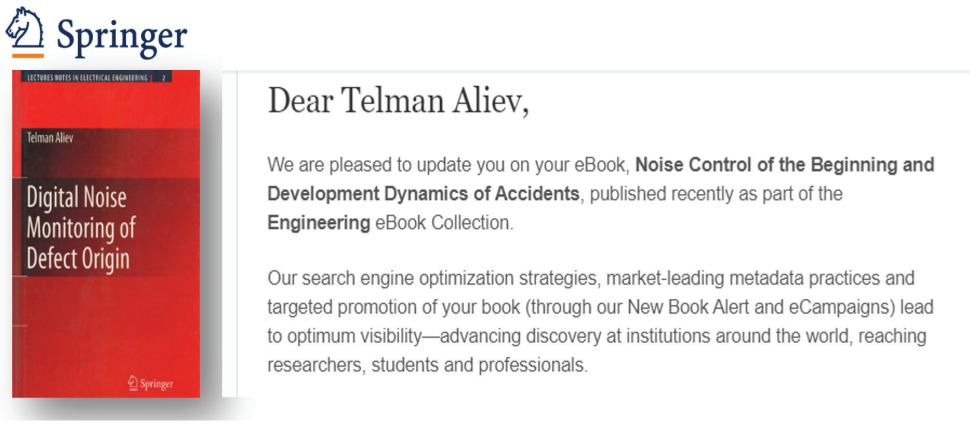


**Figure 8.** Letter from Springer Publishing House.

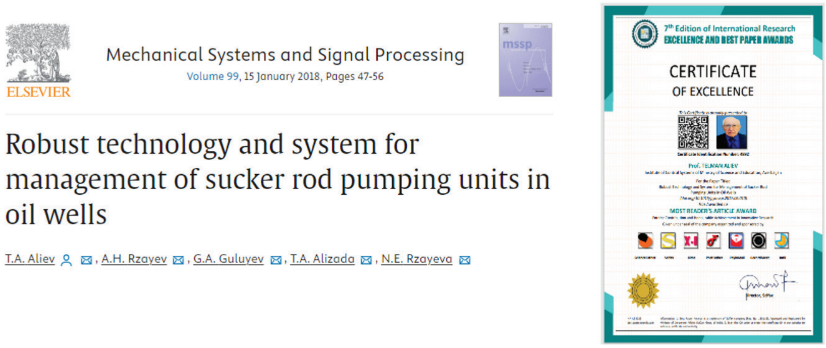


**Figure 9.** Telman Aliyev's article and certificate in the "most read article".

regard, a letter was addressed to Academician Telman Aliev by Springer Publishing House (Fig. 8).

On July 4, 2023, Telman Aliyev's article published in the international journal "Mechanical Systems and Signal Processing" was awarded a certificate in the "Most Read Article" nomination in the "International Achievements in Research and Best Article" category (Fig. 9).

Telman Aliev was academic advisor of 37 PhD and 13 DSc candidates. He is the author of 35 monographs, 462 research papers and 132 patents.

Out of 35 monographs 3 were published by Springer, 11 by Lambert Academic Publishing in Germany and other publishers, 7 of them were published in Moscow.

Of these 462 papers, 193 were published in prestigious English-language journals, 102 in national journals, 91 at international conferences and 76 in the proceedings of national conferences.

It should also be noted that out of 132 patents 67 are international patents and 65 are inventor's certificates issued in the USSR.

He is married, has a son and a daughter.

## MAIN SCIENTIFIC RESULTS

At present, the number of unexpected accidents depends largely on the qualification of personnel (master). Based on accumulated experience and information received from control systems, the latter intuitively establishes the current condition of the object and the onset of possible accidents. However, sometimes their reaction is delayed and accidents with enormous damage occur. In these facilities, the controlled parameters $g(t)$ are noisy signals, $g(t) = X(t) + \varepsilon(t)$, which, on the recommendation of Prof. N. Wiener, are filtrated from the accompanying noise $\varepsilon(t)$. This was justified by zero correlation between useful signal $X(t)$ and noise $\varepsilon(t)$: $R_{X\varepsilon}(t) = 0$. However, in real life, in real objects, when various faults preceding accidents occur, the noise $\varepsilon_2(t)$ emerges, which is correlated with the useful signal $X(t)$. In this case, the correlation $R_{X\varepsilon}(t) \neq 0$ emerges between the total noise $\varepsilon(t) = \varepsilon_1(t) + \varepsilon_2(t)$ and the useful signal $X(t)$, and the conditions of "no correlation" are violated and a part of the spectrum of the useful signal $X(t)$ overlaps with the spectrum of the noise $\varepsilon(t)$ and during filtering the results are "distorted". For this reason, the information about the onset of the accident is reflected in the measuring devices of “control” systems with a delay. Because of this, in rare cases catastrophic accidents occur on railroad transport, in aviation, at power plants, on drilling rigs, on oil wells, on offshore platforms and communications, etc.

Unfortunately, under the influence of the great authority of Prof. Norbert Wiener and other authoritative scientists, the conditions of “zero correlation between the useful signal $X(t)$ and the noise $\varepsilon(t)$” are still widely used in the analysis of noisy signals. To improve the safety of operation of control objects, using the authoritative international organizations, as well as recognized scientists, it is necessary to accelerate the solution of the problem by creating a technology of signal analysis in the presence of correlation between $X(t)$ and $\varepsilon(t)$, that occurs at the beginning of accidents.

Springer has published a monograph by Prof. Telman Aliev on this problem.

He carried out work to monitor the onset of the latent period of earthquake preparation in order to verify the applicability of signal analysis technology in the case of correlation between the useful signal and the noise.

It is well known that many different systems have been created and are used to control the beginning of seismic processes. Thanks to this, as a result of their operation, both in individual seismically active regions and throughout the world, very important information about seismic processes in the relevant countries and regions is formed.

Over time, in any seismically active region, the accumulated information is used to assess seismic hazard, for example, when planning further development of the region. However, currently, the existing seismic station equipment does not allow obtaining information about the onset of the earthquake preparation process (EPP) in advance. Our experiments have demonstrated the possibility of using the proposed technologies of noise analysis for monitoring and generating information about the onset of earthquake preparation. The results obtained have been experimentally confirmed over a long period of time. It has been established that when seismic signals are filtered in traditional seismic stations, informative attributes that arise during the onset of the earthquake preparation process are lost. It has been established that the beginning of earthquake preparation is reliably detected by using the estimates of the variance of the noise and the cross-correlation function between the useful signal and the noise of seismic-acoustic signals. Several hours later, similar estimates of seismic signals are used to repeatedly detect the continuation of the earthquake preparation process.

In order to test the practical application of the proposed technologies, a network of stations was built, which use the shafts of suspended oil wells (at depths of 38 m, 55 m, 110 m, 200 m, 300 m, 1430 m, 1800 m, 3145 m, 4000 m, and 4900 m) as inverted antennas. It has been established that in traditional technologies, when filtering out noise of seismic signals, informative attributes that arise at the beginning of the earthquake preparation process are lost. It has also been established that the onset of earthquake preparation is consistently detected, using the aforementioned estimates. It has also been established that, over a period of time, it is possible to repeatedly record the continuation of the EPP using the same characteristics of the noise of seismic signals. Based on these technologies, a hybrid intelligent system has been proposed, using which seismologists can determine the approximate time of the onset of expected earthquakes, using combinations of the results obtained.

It has also been established that by analyzing unfiltered seismic signals using these technologies, commonly used standard seismic stations can detect the onset of the EPP 0.5-1 hour before it begins. This will allow seismologists to use standard modern seismic stations to issue warnings of expected seismic hazards.

## CONCLUSION

Attached are the results of experimental work carried out between 2010 and 2025 on a network of stations that use mothballed oil wells as communication channels to obtain seismic and seismic-acoustic data from the earth's deep strata.

His monographs [1-13] and works [14-66] include the results of experimental studies conducted over many years at compressor stations, oil fields, drilling rigs, offshore platforms, in transportation, medicine, construction, and seismology.


## AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

## DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

## CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## ETHICS

There are no ethical issues with the publication of this manuscript.

## STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

Artificial intelligence was not used in the preparation of the article.

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