

# Terminological Dictionary of Automatic Control, Systems and Robotics: an Example of Good Terminological Practice<sup>★</sup>

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**Abstract:** The paper describes a case of good terminological practice in the field of automatic control, systems and robotics. It presents the history and the outcomes of terminological work in this field, firstly the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics, which has been very well accepted by the wider control community in Slovenia. The feedback from the community encouraged the authors to adapt and upgrade the Slovenian dictionary to the monolingual English Terminological Dictionary of Automatic Control, Systems and Robotics. The objective of both terminological dictionaries is to collect and unify, as far as possible, the terminology in the field of automatic control, dynamic systems and robotics. The dictionaries represent a helpful resource for students, as well as experts in the field. We firmly believe that well-defined and harmonized terminology is essential for ensuring noiseless communication between experts. Therefore, the Terminological Dictionary of Automatic Control, Systems and Robotics is expected to provide a considerable boost to the development of the field.

*Keywords:* Terminology, Automatic Control, Systems, Robotics, Dictionary, Slovene, English.

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## 1. INTRODUCTION

The study of automatic control, systems and robotics in Slovenia has a long tradition, which has led to the need for a terminological regulation of the field. In 1957, Prof. France Bremšak returned from advanced training at the University of Michigan. In addition to studying nuclear reactor dynamics, he was introduced to the theory of servo-mechanisms and analogue computing, which marked the beginning of process-control theory, mathematical modelling of dynamical systems and computer simulation in Slovenia. The field of automatic control, systems and robotics was introduced at the Faculty of Electrical Engineering, University of Ljubljana by Prof. Ludvik Gyergyek in 1962, who also invited Prof. France Bremšak to participate. Hence, the undergraduate as well as postgraduate courses in automatic control, systems and robotics were established. At the Faculty of Electrical Engineering, University of Ljubljana, these courses have always been held

in high regard. What is more, the postgraduate course in automatic control, systems and robotics was one of the earliest established in Europe. Other research, pedagogical and industrial groups soon followed. Today, the most important centres of education and research in the field of automatic control, systems and robotics are at the universities in Ljubljana, Maribor, and Nova Gorica, as well as the Jozef Stefan Institute. Furthermore, various companies in Slovenia comprise strong industrial-development groups that are also working in this field.

In addition to control-loop elements and control theory, the Slovenian school of automatic control, systems and robotics also comprises systems theory, mathematical modelling of dynamical processes, computer simulation, signal and circuit theory, measurement of electrical and non-electrical quantities, biocybernetics and robotics. Being an interdisciplinary and infrastructural scientific field, it is closely related to the life sciences, information, communication and manufacturing technologies, as well as artificial intelligence. As it based on the systemic approach

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to problem solving, it is useful in many technical and non-technical fields.

In order to ensure noiseless communication among experts in the field of automatic control, systems and robotics, the need for unified terminology has become evident. Different papers and textbooks sometimes use different terms for the same concepts, which can lead to miscommunication (BAU, 2024). Hence, different dictionaries that gathered the related terms have been published. A significant number of such dictionaries are in English, e.g., (Tver and Bolz, 1983), (Waldman, 1985), (Rosenberg, 1986), (Dorf and Nof, 1990), (Bodestedt, 1993), (South, 1995), (Jones and Jones, 1996), (Dimon, 2002). Furthermore, several bilingual dictionaries, e.g., (Schorn and Große, 2010), (Siemens A&D Translation Services, 2011), (Siemens A&D Translation Services, 2009), and a number of multilingual dictionaries, e.g., (Clason, 1977), (Broadbent and Masubuchi, 1981), (Zhelyazova, 2005), (Bajd et al., 2010), have been published as well. Despite the dictionaries have been proven useful, they have not been often referenced in scientific literature, for it is not usual to cite dictionaries. However, they are very useful to every control and robotics expert. Some descriptions of published dictionaries can be found in publications, e.g., (Privat, 1979) and (Broadbent, 1970). The authors in (BAU, 2024) compare the basic terminology in control engineering textbooks in English, Swedish and German.

Ultimately, the value of specialized terminological dictionaries lies in their reliability and accuracy. When users — whether students or professionals — seek precise definitions of technical terms, they often turn to online search engines or large language models (LLMs). However, a significant concern with these solutions is their reliability. While LLMs have made substantial advancements, they often present answers with very high confidence, even though their answers are not always totally correct (to put it mildly). This is particularly problematic in specialized fields like automatic control, systems and robotics, where precision is crucial. In contrast, a well-constructed terminological dictionary, compiled by experts in the field supported by a terminologist, offers a more dependable source of information. Although no resource is entirely immune to errors or omissions, such dictionaries are far more trustworthy for accessing terminology in specialized domains. The careful compilation process and checks ensure a higher degree of accuracy, making these dictionaries an indispensable tool for ensuring clarity and consistency in technical communication.

The paper is organized as follows. Section 2 presents the history and the outcomes of terminological work in the field of automatic control, systems and robotics in Slovenia. This is followed by Section 3, which introduces the English Terminological Dictionary of Automatic Control, Systems and Robotics. The paper ends with some concluding remarks.

## 2. TERMINOLOGICAL ENDEAVORS IN THE FIELD OF AUTOMATIC CONTROL, SYSTEMS AND ROBOTICS IN SLOVENIA

The official language of Slovenia is Slovene. However, the terms in the field of automatic control, systems and

robotics mostly originate from English. In Slovenia, the terminological problems soon became apparent both in terms of the differences between English and German literature in the earlier years, as well as in the terminological inconsistencies within the English technical texts. Furthermore, the field of automatic control, systems and robotics is present at the faculties of the Universities of Ljubljana, Maribor and Nova Gorica, as well as at Jozef Stefan Institute. Therefore, the use of terms has not been ideally consistent throughout the country.

Thankfully, the need for a systematization of the terminology was recognized relatively early on, and the earliest days of the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics date back to before the establishment of the Automatic Control Society of Slovenia in 1989. Building on the foundations laid by the IFAC Multilingual Glossary of Automatic Control Technology, pioneered by (Broadbent and Masubuchi, 1981), the first Slovene dictionary was developed soon after (Broadbent and Masubuchi, 1981) has been published. The Automatic Control Society of Slovenia published the first draft version of the terminological dictionary in 2003, initially in a limited number of paperback editions and on early electronic media, such as floppy disks. This pioneering dictionary, which served as the foundation for the current dictionary, encompassed 1054 terms and has been readily available online since 2006.

Despite its notable efforts, the dictionary proved to be somewhat outdated due to the rapid advancements in terminology. Given the dynamic nature of language, ensuring currency in terminology demands constant attention. This particular terminology, however, is not only relevant for the fields of automatic control, systems and robotics; it is of paramount importance for the maintenance of the national language. Recognizing this, in 2011, the Automatic Control Society of Slovenia made the decision to undertake a comprehensive update and enhancement of the dictionary.

### *2.1 The development of the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics*

Following the decision by the Automatic Control Society of Slovenia regarding the new dictionary, the society's officials reached out to the Department of Terminology of the Fran Ramovš Institute of the Slovenian Language to discuss the potential for a joint project. The objective of this collaboration was for the Department of Terminology to provide organizational guidance, with a particular focus on the terminological aspects. The committee of dictionary authors from representative academic institutions involved in automatic control, systems and robotics was established. It includes the University of Ljubljana, Jozef Stefan Institute and University of Nova Gorica, all from Slovenia, with the cooperation of experts from the Department of Terminology of Fran Ramovš Institute of the Slovenian language. Furthermore, as the University of Maribor, Slovenia, was not represented on the authors' committee, an external expert committee from the University of Maribor was established to independently revise the terms.

The committee of authors held regular weekly meetings from 2011 to 2014, during which time the external expert committee closely monitored the committee's progress. It soon became apparent that the project entailed more than simply updating the existing terminology; it was also about developing an entirely new dictionary. It was evident that the project required not only the expertise of specialists from the field of automatic control, systems and robotics but also the contribution of terminological experts. The terminology work involves more than just collecting and selecting terms for a dictionary; it is also about developing the national language by employing appropriate domestic terms, which often originate from English or other foreign languages. Given the importance of terminology in this regard, it is evident that automatic-control experts do not possess the necessary background to compile terminological dictionaries properly. This underscores the necessity for a multidisciplinary team for such a project, despite the increased complexity it brings.

In addition to the contributions of the authors' committee and the external expert committee, the project also involved the occasional input from more than 15 other automatic control, system and robotics experts. A comprehensive review of the published literature in Slovene was conducted to identify and extract the relevant vocabulary. To ensure the breadth of the project, literature from closely related fields such as mechanical engineering, chemical technology, computer science and metrology was also considered. Eventually, following the reviews and the technical design, the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics (Karba et al., 2014) was co-published by the Fran Ramovš Institute of the Slovenian Language at the Research Centre of the Slovenian Academy of Sciences and Arts and the Automatic Control Society of Slovenia in 2014. It includes 1753 terms and 2007 English equivalents, reflecting the extensive and meticulous research undertaken. Following the reviews and the technical design, the dictionary was co-published by the Fran Ramovš Institute of the Slovenian Language at the Research Centre of the Slovenian Academy of Sciences and Arts and the Automatic Control Society of Slovenia (Kocijan et al., 2017). Fig.1 shows the front page of the hardback version of the dictionary.

At the beginning of 2017, the authors of the dictionary decided to start the preparation of the 2nd, updated and revised edition of the dictionary. After a year and a half of intensive work in regular sessions, they have revised, corrected and updated the entire dictionary. The design and structure of the dictionary has remained the same as in the 1st edition. The authors have also taken into account the comments and suggestions made by the users of the dictionary. As with the 1st edition of the dictionary, the minutes of the sessions were reviewed on an ongoing basis by the experts from the University of Maribor. Finally, 317 entries of the dictionary have been corrected, and 275 completely new entries have been added. The 2nd, updated and revised edition of the dictionary thus contains 2020 terms and 2306 English equivalents. The 2nd, updated and revised edition of the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics (Karba et al., 2018a) was published in 2018.



Fig. 1. The front page of the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics

## 2.2 The Terminologišče website

The Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics is available online for free (Karba et al., 2018b) at the Terminologišče website. The online version of the dictionary provides all the relevant information, including the dictionary concept, its structure, the colophon, the foreword, literature, and abbreviations.

The search engine at Terminologišče is designed primarily for experts, and it offers a variety of search options. These include searching for a term (or a part of a term), searching for a particular word in the definition, or searching for an English equivalent. The search engine also returns all the terms that include the searched query, which facilitates further searching. For instance, Fig. 2 illustrates a search for the Slovenian term *model*, returning all the entries that contain the query *model*. In this case, there are 69 hits.

The Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics is also included in the dictionary portal Fran (Fran Ramovš Institute of the Slovenian Language, 2025), which comprises all the major Slovenian dictionaries (general, terminological and others), so even non-experts can look up terms from this field.

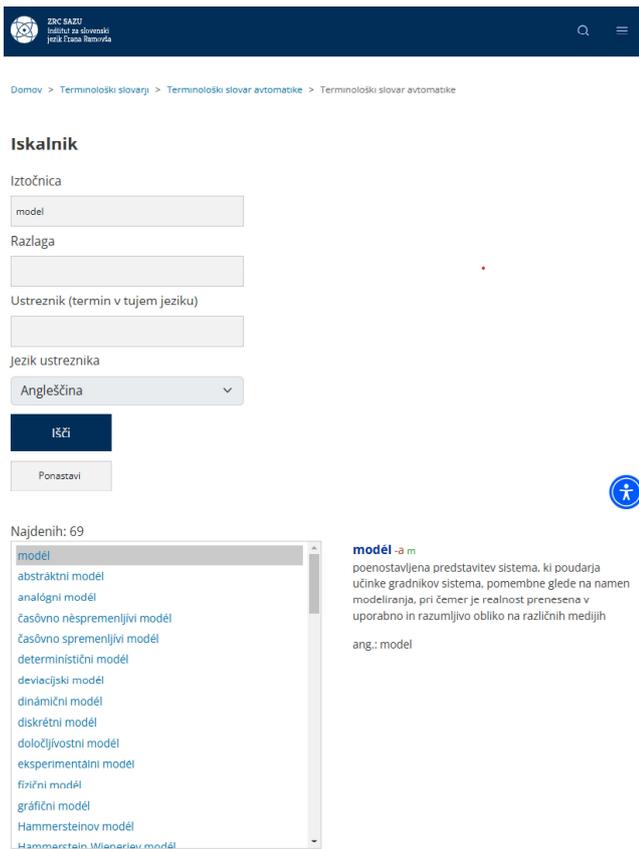


Fig. 2. Query: *model*.

### 3. THE ENGLISH TERMINOLOGICAL DICTIONARY OF AUTOMATIC CONTROL, SYSTEMS AND ROBOTICS

The Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics has been very well accepted by the wider control community in Slovenia: since its online availability, it has been directly and indirectly accessed more than 4 million times, which is a significant achievement given that there are approximately 2 million speakers of the Slovenian language.

In 2018, the committee decided to compile an English terminological dictionary based on the Slovenian terminological dictionary. New terms were added, and the definitions were significantly expanded. After more than 100 additional meetings of the committee, the Terminological Dictionary of Automatic Control, Systems and Robotics was published by Springer (Karba et al., 2024) in 2024.

#### 3.1 About the dictionary

The Terminological Dictionary of Automatic Control, Systems and Robotics contains 2433 dictionary entries from the field of automatic control, which includes mathematical modelling, simulation of dynamic systems, automation technology with its corresponding elements, and robotics. It also covers signal processing, information technologies and production technologies. It is a monolingual dictionary, originating from the Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics.

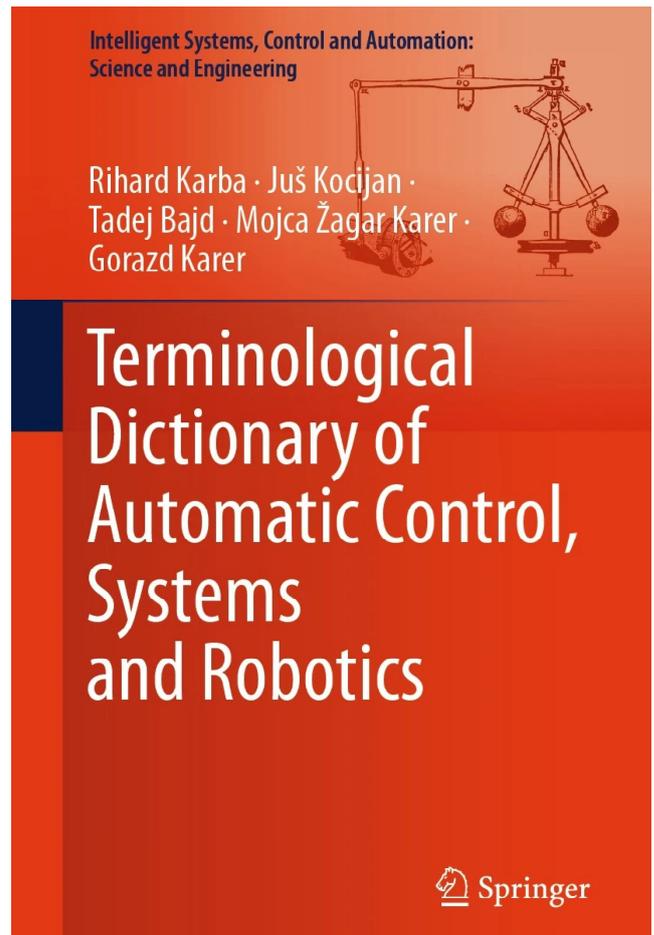


Fig. 3. The front page of the English Terminological Dictionary of Automatic Control, Systems and Robotics

However, the dictionary is not a mere translation of the Slovenian edition, but rather its adaptation and upgrade. Compared to the Slovenian, the English Terminological Dictionary of Automatic Control, Systems and Robotics comprises longer definitions consisting of several sentences, and provides more examples.

The terminological dictionary is intended primarily for experts and students who work with control engineering and dynamic systems in both technical and non-technical fields. To be able to use the dictionary, at least a basic knowledge of the field is required. The dictionary provides users with concise definitions of terms. A concept may be described by several terms, so cross-references are used.

As the terms are primarily found in technical texts, the relevant technical literature was consulted and reviewed systematically in order to compile the dictionary entries. They were also checked in secondary sources, i.e. related terminological dictionaries and lexicons. All available electronic sources were considered, and an index of the essential literature used is provided at the end of the dictionary.

The dictionary is arranged alphabetically, reflecting the current state of terminology in this subject field. Older terms that are no longer in use are excluded, as are explanations of the historical development of concepts or the etymology of terms. The dictionary does not include the established terms from related subject fields that are

used in automatic control, but are defined in the same way as in the primary discipline (e.g., the mathematical term *Laplace transform*, the electronics term *microprocessor*). The primary intended users of this dictionary are experts in the field, and they are thus familiar with the terminology. However, due to the interdisciplinary nature of automatic control, systems and robotics, some terms from closely-related disciplines (e.g. 'lean manufacturing') have been included.

### 3.2 Compiling the dictionary

The Terminological Dictionary of Automatic Control, Systems and Robotics (Karba et al., 2024) is conceptually based, in the sense that terms are treated as designations for concepts that constitute the conceptual system of a given discipline. As such, terminology work must take into account the relations between terms. These relations may be expressed explicitly in the dictionary, for example as an arrow indicating a synonymous pair (i.e. two terms for the same concept), or implicitly, for example as a hierarchical relation of superordinate and subordinate, which is often expressed in a definition.

The tasks related to terminology work are usually carried out in thematic groups. For example, terms denoting various types of *sensors* (e.g. *capacitive level sensor*, *conductivity level sensor*, *ultrasonic level sensor*, *optical level sensor*, etc.) are discussed together. The simultaneous discussion of the related concepts facilitates the description of the distinguishing features of the concepts (e.g. *centralised control* vs. *decentralised control*), which is also valuable for the elimination of possible conceptual inconsistencies.

### 3.3 The structure of the dictionary

The terms under consideration are part of a terminological system that reflects the conceptual system of the subject field. In the dictionary, the terms are presented in separate entries. An entry consists of the term, the definition, and (optionally) one or more synonyms. The definition may consist of up to four sentences, most often it includes three or four sentences. A basic example is shown below.

**thermal anemometer** → hot-wire anemometer

**hot-wire anemometer** An anemometer, which measures heat loss of a wire placed in a flowstream using the constant-current method or the constant-temperature method. It consists of a sensing element, a thin electrically-heated wire exposed to the measured fluid flow, and electronic equipment generating the output signal. Proportionality with the measured flow rate is obtained from the resistance change caused by the temperature change of the wire, or from the current needed to maintain the temperature and thus the resistance of the wire unchanged.

**S: thermal anemometer**

**anemometer** A sensor, which measures the velocity of atmospheric wind or of a gas flow, e.g., cup anemometer, vane anemometer, hot-wire anemometer.

Here, the term *thermal anemometer* is cross-referenced to the preferred term *hot-wire anemometer*. The term *hot-wire anemometer* is followed by its definition, which ends with a possible list of synonyms. In this case, there is

only one synonym, namely the term *thermal anemometer*. In addition, an interested user can also look up the superordinate term *anemometer*, which is also defined in the dictionary.

## 4. CONCLUSION

The Slovenian Terminological Dictionary of Automatic Control, Systems and Robotics has been very well accepted by the wider control community in Slovenia. The feedback from the community encouraged the authors to adapt and upgrade the Slovenian dictionary to the monolingual English Terminological Dictionary of Automatic Control, Systems and Robotics. It is important to acknowledge the pivotal role of the Automatic Control Society of Slovenia, a member of IFAC, in the initiation and sustained support of both the Slovenian terminological dictionary project and the English terminological dictionary project. Without this initiative and continuous support, the completion of these projects would have been significantly impeded or even rendered unfeasible.

As with the Slovenian edition, the objective of the new English terminological dictionary is to collect and unify, as far as possible, the terminology in the field of automatic control, dynamic systems and robotics. The dictionary will be a helpful resource for students, offering direct access to the technical language, which is essential for effective communication in their field of study. It will serve as a comprehensive tool, assisting students in writing theses and reports by providing clear definitions and cross-references to preferred terms.

The primary value of specialized terminological dictionaries lies in their reliability. When users seek accurate definitions of technical terms, they often resort to online search engines or LLMs. However, the trustworthiness of these tools can be problematic. In contrast, a terminological dictionary, carefully compiled and reviewed by experts in the field alongside professional terminologists, offers a much more dependable solution. While no resource is entirely free from errors, such terminological dictionaries are far more reliable, especially in highly specialized domains like automatic control, systems and robotics.

We firmly believe that well-defined and harmonized terminology is essential for ensuring noiseless communication between experts. Therefore, the Terminological Dictionary of Automatic Control, Systems and Robotics is expected to provide a considerable boost to the development of the field.

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