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PAPERS IN ENGLISH

RUBRIC

«TECHNICAL SCIENCES»

RELEVANCE OF THE METHOD OF ACCELERATED COORDINATION OF RELAYS TO ENSURE THE RAPIDITY OF RELAY PROTECTION

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Abstract. The necessity of application of mathematical method of accelerated relay coordination to achieve the goals of increasing the reliability and speed of modern power systems is discussed.

Keywords: power system, electric power industry, relay protection, relay coordination, protection reliability, speed performance.

The reliability and continuity of a power system depend directly on a well-tuned relay protection (RP), which is subject to serious requirements. In the event of a mains failure or malfunction, the protection circuitry must eliminate it with minimum losses by immediately isolating the damaged part from the faulty part to ensure the required continuity of supply. For greater stability, in addition to the main relay protection, its backup type is used. In the power system, a fault causes the main relay to activate immediately, and if it fails, the standby relay responds [3, p. 186]. By virtue of its operating principle the relay also switches off a considerable part of the normally functioning system, thus minimizing power continuity and increasing power loss. Then, due to heating, the energy dissipation increases, leading to equipment failure. All this

turns out to be economically undesirable. In addition, it is important to note that a significant number of relay trips are caused not by true network faults, but by faulty relay settings [4, p. 58]. Thus, there is a need for a reliable, correct, and efficient relay coordination scheme with an accelerated computation process and performance that could be considered optimal [5, p. 90419].

Since many power systems contain two-way and ring power flow topologies, a technically and economically suitable protection scheme should consist of overcurrent directional relays (ODRs). The design of the ODR protection depends on the time setting assignment (TSA) and the pin setting assignment (PSA). The protection engineer is able to coordinate the relays in the same time as the main relay fault is eliminated if the directional and directional sounders are properly set. It is important that the directional sounders and sounders of each relay be in clear agreement with the other standby relays, but the fact that all relays have different settings, the process of coordinating them is not an easy task [6, p. 161]. The fact that each two relays have two parameters (directional sounders and sounders) leads to an increase in the number of variables to be included in the problem [1, p. 94]. Therefore, in systems with a large number of relays and constraints, the complexity of their coordination is intensive and requires a special method of accelerated relay coordination [2, p. 7].

Bibliography:

1. Рахматуллин С.С., Аверьянова Ю.А. Разработка методов повышения эффективности распределения электроэнергии на основе концепции умных сетей электроснабжения / С.С. Рахматуллин, Ю.А. Аверьянова // Вестник Кыргызско-Российского Славянского университета. – 2021. – № 12. – С. 93-101.
2. Рахматуллин С.С., Губаева О.Г. Применение программы «Maple» для расчета неизвестных токов электрической цепи // Новые информационные технологии и системы в решении задач инновационного развития: сб. статей Междунар. научно-практической конф. (Казань, 27 мая 2021 г.). – Уфа, 2021. – С. 5-9.
3. Рахматуллин С.С. Исследование интеграции мер по предотвращению аварий в энергосистеме и обществе // Ресурсосберегающие технологии в контроле, управлении качеством и безопасности: Сб. научных трудов X Междунар. конф. школьников, студентов, аспирантов, молодых ученых (Томск, 09–11 ноября 2021 г.). – Томск, 2022. – С. 184-187.
4. Amol A., Nitin D. Optimum Coordination of Directional Overcurrent Relays Using Modified Adaptive Teaching Learning Based Optimization Algorithm / A. Amol, D. Nitin // Intelligent Industrial Systems. – 2016. – № 1. – P. 55-71.
5. Khurshaid T. et al. An Improved Optimal Solution for the Directional Overcurrent Relays Coordination Using Hybridized Whale Optimization Algorithm in Complex Power Systems / T. Khurshaid et al. // IEEE Access. – 2019. – № 7. – P. 90418-90435.
6. Sengupta S., Sanchita B., Richard A. Particle Swarm Optimization: A Survey of Historical and Recent Developments with Hybridization Perspectives / S. Sengupta, B. Sanchita, A. Richard // Machine Learning and Knowledge Extraction. – 2019. – № 1. – P. 157-191.

EXAMPLE OF MODERN ACCELERATED RELAY PROTECTION ON A NINE-BUS POWER SYSTEM

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Abstract. This paper proposes for consideration an example of modern advanced relay protection on a complex energy system.

Keywords: power system, electric power industry, relay protection, relay coordination, protection reliability, power grids.

The proposed algorithm for accelerated coordination is tested on a complicated interdependent nine-bus system with 24 overcurrent direction relays (Fig.) [6, p. 272], which make it necessary to optimize twice as many variables – 48 [3, p. 186]. In the event of a fault on the third line, the fifth and sixth relays isolate it from the serviceable part of the network, but, in the event that the sixth relay fails, after 0.2 seconds the task of providing protection shifts to the adjacent reserve twenty-third and eighth relays, according to their classification into left and right side groups as described [4, p. 95]. Within this division, for the main relay 1, its neighboring backup relays will be relays 15 and 17, and the backup relay for the main relay 1 will be relay 4, etc. [1, p. 7].

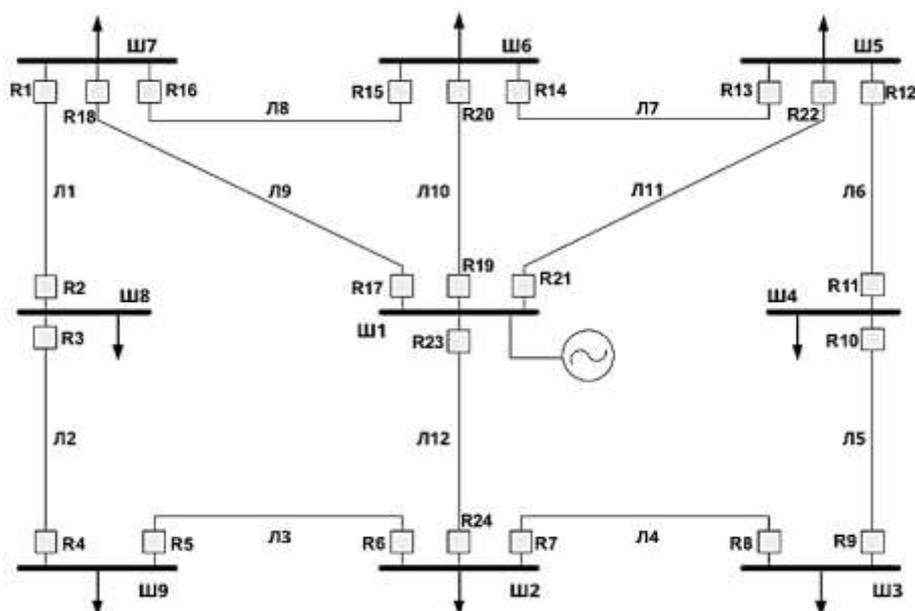


Figure 1. System with a 100 MVA, 33 kV – source

Then it is possible to find the values of the maximum short-circuit current. In the same system under study, the accelerated coordination method is compared not only with the particle swarm algorithm, but also with the genetic algorithm [2, p. 51]. The latter two algorithms took the same amount of time to optimize, about 33 seconds, while the proposed method performed the calculation of the best time and plug setpoints in less than 17 seconds, which represents the effectiveness of the advanced mathematical model for accelerated coordination of power system relay protection [5, p. 6].

Bibliography:

1. Рахматуллин С.С., Губаева О.Г. Применение программы «Maple» для расчета неизвестных токов электрической цепи // Новые информационные технологии и системы в решении задач инновационного развития: сб. статей Междунар. научно-практической конф. (Казань, 27 мая 2021 г.). – Уфа, 2021. – С. 5-9.
2. Рахматуллин С.С., Елфутин М.Д., Умурзаков А.К., Мифтахов А.Р. Показатели генерации электроэнергетических мощностей в Эфиопии // Материалы и методы инновационных научно-практических исследований и разработок: сб. статей Междунар. науч.-практ. конф. (Самара, 17 марта 2022 г.). – Уфа, 2022. – С. 50-52.
3. Рахматуллин С.С. Исследование интеграции мер по предотвращению аварий в энергосистеме и обществе // Ресурсосберегающие технологии в контроле, управлении качеством и безопасности: Сб. научных трудов X Междунар. конф. школьников, студентов, аспирантов, молодых ученых (Томск, 09–11 ноября 2021 г.). – Томск, 2022. – С. 184-187.
4. Рахматуллин С.С. Разработка методов повышения эффективности распределения электроэнергии на основе концепции умных сетей электроснабжения / С.С. Рахматуллин, Ю.А. Аверьянова // Вестник Кыргызско-Российского Славянского университета. – 2021. – № 12. – С. 93-101.
5. Рахматуллин С.С. Электрические цепи в концепции применения теории графов // Модели инновационных решений повышения конкурентоспособности Отечественной науки: сб. статей Национальной (Всеросс.) науч.-практ. конф. (Омск, 22 июня 2021 г.). – Уфа, 2021. – С. 5-8.
6. Singh M. et al. Optimal coordination of directional over-current relays using informative differential evolution algorithm / M. Singh et al. // J. Comput. Sci. – 2014. – № 5. – P. 269-276.

MODERN RELAY PROTECTION: AN ADVANCED METHOD OF RELAY COORDINATION

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Abstract. This paper attempts to consider the prerequisites for creating an advanced method of accelerated relay coordination, designed to improve the reliability and speed of relay protection of power systems.

Keywords: power system, electric power industry, relay protection, relay coordination, protection reliability, evolution method.

Researchers have resorted to the following different mathematical methods and algorithms to solve problems of this nature: differential evolution method, particle swarm algorithm, simplex method, genetic algorithm, etc. [3, p. 213]. However, their application in practical optimization of proper relay protection is time-consuming or difficult at all, which raises the problem of accelerated and qualitative relay coordination. This problem acquires an even larger scale in the context of power supply intellectualization, where higher requirements are imposed on relays for efficient and correct protection coordination [1, p. 185]. Evolutionary algorithms could solve the problem, but their results and computation time are, unfortunately, correspondingly inefficient and unsuitable for the required conditions.

In order to overcome the problem of optimal solution strategy algorithms and provide efficient solutions for current state-of-the-art and future smart grids, an advanced ODR coordination method characterized by simplicity, practicality and an accelerated computation process is presented in [4, p. 614]. The method allows it to be implemented in evolutionary algorithms as a patch to achieve global values in optimization processes.

In this study, the introduction of a bounded target function allows to formulate the relay coordination problem. The latter is an operation time function that is divided into two separate components, which makes it possible to reduce the complexity and dimensionality of the mentioned constraints, in the sense that each of them is optimized separately with reduced constraints.

The effectiveness of the proposed method is verified in the study through its application to two specific systems with 12 and 24 ODRs, where the analysis of their faults as well as power flows is carried out in the power system simulation software DigSILENT, and the data in the MATLAB computer package. The target functions in the work are solved by the proposed methodology, the results are compared with the TSA and PSA, confirming that the simplicity of solving the problem is due to the separation of the target function into isolated parts, which ultimately eases the computational burden of relay coordination and improves the characteristics of the relay protection scheme.

The complexity of relay coordination in large-scale power systems causes a large number of computational operations, the research of simplification and acceleration problems of which led to the development of the accelerated coordination method proposed in the above study. This advanced approach allows to solve problems of this kind more qualitatively, in the sense that optimization algorithms within the considered method are characterized by better convergence, selecting those relay settings that can provide the proper quality of relay protection reliability in large-scale power systems and power grids of intelligent type [2, p. 95].

Bibliography:

1. Рахматуллин С.С. Исследование интеграции мер по предотвращению аварий в энергосистеме и обществе // Ресурсосберегающие технологии в контроле, управлении качеством и безопасности: Сб. научных трудов X Междунар. конф. школьников, студентов, аспирантов, молодых ученых (Томск, 09–11 ноября 2021 г.). – Томск, 2022. – С. 184-187.
2. Рахматуллин С.С. Разработка методов повышения эффективности распределения электроэнергии на основе концепции умных сетей электроснабжения / С.С. Рахматуллин, Ю.А. Аверьянова // Вестник Кыргызско-Российского Славянского университета. – 2021. – № 12. – С. 93-101.
3. Chaitanya A., Rohit J., Swathika O. Optimum coordination of overcurrent relays in distribution systems using differential evolution and dual simplex methods / A. Chaitanya, J. Rohit, O. Swathika // 2017 International Conference on Computing Methodologies and Communication. – 2017. – № 1. – P. 212-215.
4. Kheshti M., Kang X., Jiao Z. An innovative fast relay coordination method to bypass the time consumption of optimization algorithms in relay protection coordination / M. Kheshti, X. Kang, Z. Jiao // Journal of Electrical Engineering and Technology. – 2017. – № 2. – P. 612-620.

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«PHILOSOPHY»

THE CATEGORY OF SALVATION IN THE THEOLOGICAL AND PEDAGOGICAL HERITAGE OF TIKHON ZADONSKY

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Abstract. The article discusses the main reasons for the formation of St. Tikhon of Zadonsk as a theologian. The salvation of man in God is one of the main theological themes of the saint. The doctrine of salvation contains the creation of the world, the creation of man, the fall, redemption. The saint showed that all three persons of the holy Trinity participate in the work of human salvation.

Keywords: Salvation, the creation of the world, the creation of man, the fall, love, redemption, the church, the sacrament, education.

The theological heritage of St. Tikhon of Zadonsk is great and multifaceted. It is conventionally divided into moral and ascetic works, pastoral theology, letters, moral words, as well as words spoken and addressed to the Voronezh flock. According to his works, Symphonies on his creations and an alphabetical index to the works of the saint were compiled.

His biography sheds light on the formation of the saint as a theologian. The future saint was born in 1724 on the territory of the Novgorod province in the village of Korotsk in the family of the rural sexton Savely Kirilov and his wife Dominika. His parents gave him the name Timofey. His father had a very modest income. Widowed early, the mother supported seven children as best she could. All of them were in dire need of daily bread. In order to somehow help his mother, young Timofey was hired by wealthy land users to dig up beds for a small fee or for food. Despite all the hardships of life, the children were brought up in love with God, in the hope of His all-good providence. And it was this hope that saved the family from excessive grief and sadness, and formed the children compassionate, caring and loving.

Having barely reached the age of thirteen, Timofey was sent to a theological school, which was established at the Bishop's Novgorod house. But the training there was not free. The poor mother was unable to pay for her son's education. And the elder brother Peter took all the costs of Timothy's education on himself. Timofey himself, knowing the difficult financial situation of the family, worked part-time wherever he had to. All this in the boy even more excited the desire to study. This is evidenced by the fact that when in 1740 the school was transformed into a seminary, Timofey, among the best students, continued his studies at the seminary at the state expense. There he devoted himself with every zeal to reading theological patristic literature and prayer. The future saint will carry the knowledge gained within the walls of the seminary through his whole life. It is knowledge, deep and meaningful, that will help him form as a theologian, a bishop of the Church. In 1750, while still a student of the theological class, Timothy was given the honor of teaching Greek, and at the end of the course, he was entrusted with the position of teacher of rhetoric and

philosophy. In 1758 Timofey took monastic vows with the name Tikhon. During the same period, he took the place of the prefect of the seminary. But soon he was summoned to St. Petersburg, where he was ordained a hierodeacon, and then a hieromonk. In 1759, Father Tikhon was sent to the Tver diocese, where upon arrival he was elevated to the archimandrite of the Zheltikov Monastery. A little later, he was sent to the Otroch monastery and appointed to the post of rector of the Tver Seminary and a teacher of theology. In May 1761, Archimandrite Tikhon was consecrated bishop of Kexholm and Ladoga, and in 1763, by the decision of the Holy Synod (at the insistence of the Empress), St. Tikhon was appointed to the Voronezh department (instead of the deceased Ioannikiy Pavlutsky).

Bishop Tikhon found the Voronezh department in a deplorable state. Many things in it needed to be reorganized and corrected, there was an acute shortage of clergy. The consequence of the above problems was the terrifying religious and moral state of the laity, among whom pagan prejudices reigned. Bishop Tikhon, having assumed the duties of the ruling bishop of the Voronezh diocese, quickly got his bearings in the situation and immediately, as soon as possible, took the necessary measures to correct the situation. He personally toured villages and villages with a sermon, received and listened to visitors, organized schools. He tirelessly worked to improve the moral and educational level of the diocesan clergy entrusted to him. To do this, St. Tikhon recreated the Voronezh Seminary, which has always been under his personal control. Bishop Tikhon based his sermons and conversations with seminarians, clergy and laity on evangelical themes. The theme of salvation in God ran like a red thread through all the conversations of the saint. She is the main one in all his epistolary heritage.

The doctrine of the Salvation of St. Tikhon of Zadonsk echoes the soteriology of the holy Fathers of the Church of the classical theological period. In his works, anthropological views are preceded by reflection on God's creation of the world, His Providence for the world. By Providence, the saint understands the management and guidance of the world to the realization of His Divine plans. The anthropology of the saint is based on the fact that man came out of the hands of the Creator in the most perfect form, both in bodily and spiritual nature, being the crown and completion of all earthly creation. The Council of the Holy Trinity, which preceded the creation of man, gives the right to believe that God decided to create a being of high dignity and special purpose. This appointment of a person is seen by the saint in eternal unity with Himself. About man as the crown of creation, the saint points to the image of God, according to which man was created, and to the likeness of God. The saint understands the likeness of God in man as an indestructible conscious striving for his Prototype and the fulfillment of His holy will. That is, a person must constantly become like the Prototype in his life, and through this become the heir of eternal goods. Tikhon Zadonsky exclaims about this: "O most gracious and most beautiful creature of God, man: the image of God, as he has the royal seal in himself, the tsar is honest, his portrait is also honest. God, the Heavenly King, is worthy of every honor: man is also worthy of honor."

The essence of a person is determined not only by the soul, but also by the body, since God created both the soul and the body. But the saint considers the soul to be a more important component of the essence of man: "The beauty of the soul is eternal ..., the beauty of the body is temporary." The soul has the breath of life in it and is the bride of the Son of God, the daughter of the Heavenly Father and the temple of the Holy Spirit. Hence, the primary role of man in the world becomes obvious. The Creator, being omnipotent, endowed man with the ability to creatively create and rule. The real greatness of man lies not in his indisputable kinship with the universe and not in the superiority of his position among creatures, but in the fact that he has a part in the Divine life, being the bearer of a God-like soul. In his theological works, the saint does not separate the concepts of soul and spirit. He considers them only different states of the same entity.

Bibliography:

1. St. Tikhon of Zadonsk collected works in (five volumes). Publishing house Sisterhood in the name of St. Ignatius of the Caucasus, 2008.
2. St. Tikhon of Zadonsk. Christian Instruction. Moscow Blagovest Publishing House, 2016.
3. St. Tikhon of Zadonsk. The mystery of joy. Moscow ed. Nikkei, 2019.

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