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SEQUENCE OF CONTENT GENERATION FOR EDUCATIONAL SYSTEM

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Abstract: *The goal is to form an educational resource that allows to organize an effective learning process through adaptive learning. The development of an information management algorithm (training content), taking into account the features of the learning path for each student, is relevant. The planned novelty of the developed algorithm for the formation of content, which is adapted for each student, taking into account his type of perception. Main objectives: 1. To conduct a survey among respondents about the intelligent adaptive information and training system; 2. Determine the type of perception of the user; 3. Determination of the level of knowledge in the chosen discipline; 4. Formation of the sequence of content for the selected course. As a result of the study, it is planned to obtain an algorithm for the formation of content for an educational system for distance learning, which is adapted for each student, taking into account its features. The adaptive system assumes: learning flexibility in an interactive educational environment; personalization and adaptation of learning; diverse content by type of perception; free access to content regardless of geography. It is an intelligent adaptive system that allows users to develop revolutionary educational and methodical materials, as well as to form individual learning paths. The adaptability of the system is that each user will have their own learning path. Users log on to the system pass 2 tests that will determine the type of perception and level of knowledge for a particular course. The system will provide a variety of content each time. On the basis of the developed algorithm, an adaptive online educational process is being developed, according to which the forms of education for people with disabilities and persons with disabilities will be developed and alternative forms of content presentation will be created for them. The development and implementation of an online process will make it possible to abandon expensive foreign training systems. As a result, the principle of managed interactive self-education will be implemented, which leads to a decrease in the destructive effects of ICT on students' cognitive and social activities.*

Keywords: *adapted system, personalized content, content formation, information and training system*

АҚПАРАТТЫҚ-ОҚЫТУ ЖҮЙЕСІНІҢ КОНТЕНТІН АНЫҚТАУ

Аңдатпа: *Мақаланың мақсаты бейімделген оқыту арқылы тиімді оқу үрдісін ұйымдастыруға мүмкіндік беретін білім беру ресурсын құру. Әр студенттің оқу жолының ерекшеліктерін ескере отырып, ақпараттық басқару алгоритмін әзірлеу (оқыту мазмұны) маңызды болып табылады. Әрбір студентке бейімделетін және түйсіктердің түрін ескеретін мазмұнды қалыптастыру алгоритмінің жоспарланған жаңалығы енгізіледі. Негізгі міндеттері: 1. Респонденттер арасында зияткерлік адаптивті ақпарат пен оқыту жүйесі туралы сауалнама жүргізу; 2. Пайдаланушының түйсік түрін анықтау; 3. Таңдалған пән бойынша білім деңгейін тексеру; 4. Таңдалған курстың мазмұнының реттілігін құрастыру. Зерттеу нәтижесінде қашықтықтан оқытудың білім беру жүйесіне арналған мазмұнды қалыптастырудың алгоритмін алу жоспарлануда, ол әрбір студентке оның ерекшеліктерін ескере отырып бейімделеді. Адаптивті жүйе: интерактивті білім беру ортасында икемділікті үйренуді; оқуды дербестендіруді және бейімдеуді; қабылдау түрі бойынша әртүрлі мазмұнды; географияға қарамастан мазмұнға еркін қол жеткізуді талап етеді. Революциялық оқу-әдістемелік материалдарды дамытуға, сондай-ақ жеке оқыту жолдарының құралымына мүмкіндік беретін зияткерлік бейімдеу жүйесі. Жүйенің бейімделуі әрбір пайдаланушыда өзінің оқу жолына айналады. Пайдаланушылар жүйенің 2 сынағынан өтеді, олар белгілі бір курстың түйсік түрі мен білім деңгейін ұйғару. Әр жолы жүйе әрқилы мазмұнды ұсынады. Дамыған алгоритм негізінде мүгедектер мен*

мүгедектерге арналған білім беру формалары әзірленеді, олар үшін контент-презентацияның балама түрлері жасалады. Ғаламтордағы процесті әзірлеу және енгізу қымбат шетелдік оқыту жүйелерінен бас тартуға қолайлы жағдай жасайды. Нәтижесінде, басқарылатын интерактивті өзін-өзі оқыту принципі іске асырылатын болады. АКТ-ның студенттердің танымдық және әлеуметтік қызметіне әсерін төмендетеді.

***Түйінді сөздер**: бейімделген жүйе, дербестендірілген мазмұн, мазмұнды қалыптастыру, ақпарат және оқыту жүйесі*

ФОРМИРОВАНИЕ ПОСЛЕДОВАТЕЛЬНОСТИ КОНТЕНТА В ИНФОРМАЦИОННО-ОБУЧАЮЩЕЙ СИСТЕМЕ

***Аннотация**: Целью является формирование образовательного ресурса, позволяющего организовать эффективный процесс обучения с помощью адаптивного обучения. Актуальным является разработка алгоритма управления информацией (контентом обучения) с учетом особенностей траекторий обучения для каждого обучающегося. Планируемая новизна разработанного алгоритма – формирование контента, который адаптируется для каждого обучающегося, с учетом его типа восприятия. Основные задачи: 1. Провести анкетирование у респондентов об интеллектуальной адаптивной информационно-обучающей системе; 2. Определение типа восприятия у пользователя; 3. Определение уровня знаний по выбранной дисциплине; 4. Формирование последовательности контента по выбранному курсу. В результате исследования планируется получить алгоритм формирования контента для образовательной системы в дистанционном обучении, который адаптируется для каждого обучающегося, с учетом его особенностей. Адаптивная система предполагает: гибкость обучения в интерактивной образовательной среде; персонализацию и адаптацию обучения; многообразный контент по типу восприятия; свободный доступ к контенту вне зависимости от географии. Именно интеллектуальная адаптивная система позволяет разрабатывать революционные учебно-методические материалы, а также формировать индивидуальные траектории обучения. Адаптивность системы в том, что у каждого пользователя будет своя траектория обучения. Пользователи при входе в систему сдают 2 теста, которые определят тип восприятия и уровень знания по определенному курсу. Система будет предоставлять каждый раз многообразный контент. На основе разработанного алгоритма разрабатывается адаптивный образовательный онлайн-процесс, по которому будут развиты формы обучения инвалидов и лиц с ограниченными физическими возможностями, а также будут созданы для них альтернативные формы представления контента. Разработка и внедрение онлайн-процесса позволит отказаться от зарубежных дорогостоящих обучающих систем. В результате будет реализован принцип управляемого интерактивного самообразования, что приводит к снижению деструктивных влияний ИКТ на когнитивную и социальную деятельность обучающихся.*

***Ключевые слова**: адаптированная система, персонализированное содержание, формирование контента, информационно-обучающая система*

INTRODUCTION

Smart technologies in education, such as mobile, intelligent web applications, which help optimize university costs for material and technical support, as well as raise the quality of educational services and products, are of great importance. Smart-technologies that allow to develop revolutionary teaching materials, as well as to form individual learning paths. [1]

The learning process for each student is the same, and the material for each course is the same. For a smart learner, the content may be too simple and insufficient, and therefore ineffective, and for a weak learner it may be difficult and incomprehensible. An intellectual system is needed that will take into account the initial knowledge of a certain course and type of perception.

The effectiveness of training lies in the relevance of the development of an information management algorithm (training content) and its

complexity, taking into account the characteristics of the learning path for each student.

The purpose of the intellectual system is to form a sequence of content that allows to organize an effective learning process using adaptive learning. The planned novelty of the developed algorithm for the formation of content, which is adapted for each student, taking into account his type of perception. Main objectives: 1. To conduct a survey among respondents about the intelligent adaptive information and training system; 2. Determine the type of perception of the user; 3. Determination of the level of knowledge in the chosen course; 4. Formation of the sequence of content for the selected course. The adaptive system assumes: learning flexibility in an interactive educational environment; personalization and adaptation of learning; diverse content by type of perception; free access to content regardless of geography. It is an intelligent adaptive system that allows to develop revolutionary educational and methodical materials, as well as to form individual learning paths.

ANALYSIS OF THE IDENTIFICATION OF THE NEED FOR THE USE OF LEARNING SYSTEMS

A survey was conducted among 94 respondents about the use of an adaptive intelligent learning system. Questions were devoted to distance learning. Since the adaptive system in the first place can be used in distance learning.

In one of the questions it was necessary to indicate from which city user filling out a questionnaire, or user would like to study. This will show the interest of residents of different cities. In Figure 1 showing cities, which respondent selected.

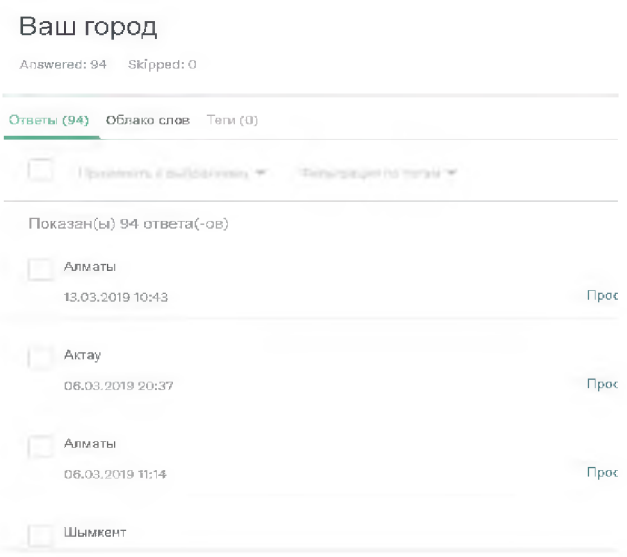

Figure 1– Select respondent city

The following questions are intended to determine the social status (student, student, employee, retired, unemployed), on the use of distance learning. The question of the assimilation of information will also allow to determine the type of perception among users in addition to testing to determine the type of perception. In Figure 2 shown percentage of using distance learning.

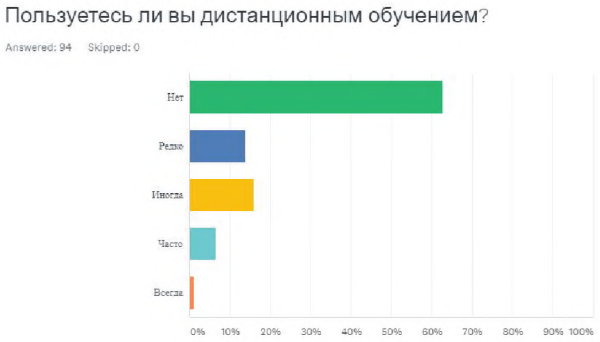

Figure 2 - Using distance learning

In Figure 3 shown learning information from respondents.

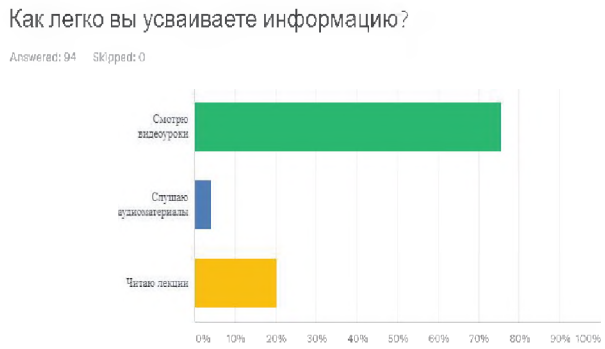

Figure 3 – Learning information from users

The Figure 4 shows the answers to the question of a positive / negative attitude towards an adaptive intellectual system.

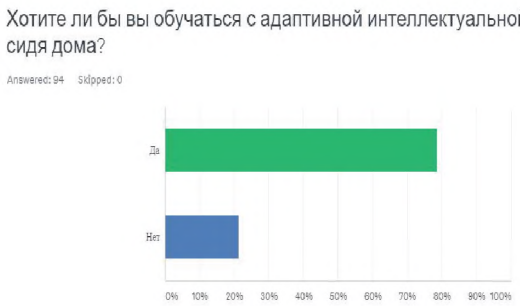

Figure 4 – Result of survey

The survey results showed that more than 80% of respondents expressed a desire to study with an adaptive intellectual system while sitting at home.

SEQUENCE OF CONTENT GENERATION ALGORITHM

The adaptability of the system is that each user will have their own learning path. Users log on to the system pass 2 tests that will determine the type of perception and level of knowledge for a particular course. The system will provide personalized content each time.

Consider the content generation algorithm. The relationship between the T_N topics of any course can be represented as a directed graph G_T, the vertices of the graph are topics, and the arcs define the relationship between the topics. In Figure 5 illustrate dependence between topics in one course. [2]

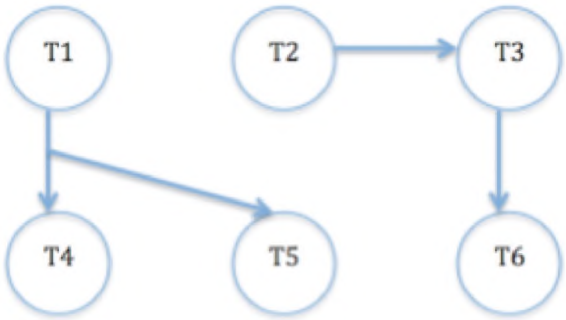

Figure 5 - Dependence between topics

Properties of the topic graph G_T:

1. There is an initial vertex that corresponds to the beginning of learning process, and an ending vertex that corresponds to the end of learning process.

2. G_T is an infinite graph, since having mastered the sequence of topics, the beginning of which is some topic T ‘, the student cannot begin to study it again.

3. Since the graph GT is infinite, it can be decomposed into levels, that is, represented as a hierarchy. [3]

In this case, at the upper level there will be a fictitious initial vertex, and at the lower level, a fictitious final vertex, which corresponds to the end of the learning process. The final vertex is determined on the basis of the analysis of the competencies that the student must have after graduation.

Consider the algorithm decomposition into levels of an infinite graph G_T [4]:

1. Find a vertex without incoming arcs and assign it a rank r = 0. Delete arcs from this vertex.

2. Suppose that at some stage in the graph there are no vertices without incoming arcs. Assign the following value of rank r to these vertices and cross out the arcs that go out of them.

3. Stage 2 is repeated until all the vertices are ranked..

Remark 1. The infiniteness property is hereditary, that is, if any vertex of the graph is deleted along with incident arcs, the remaining subgraph is also an infinite.

Remark 2. Non-contour graphs have the following properties:

a) There is at least one vertex without incoming arcs (initial vertex);

б) There is at least one vertex without outgoing arcs (called finite);

в) The graph can be represented as a hierarchy, that is, decomposed into levels, while the level number is the length of the maximum path from the initial vertex to the vertex of this level.

Consider the operation of the algorithm for decomposing an infinite graph into levels. In Figure 6 represented by an infinite graph G_T .

Find vertices without incoming arcs and assign them the rank $r = 0$. In this example, the vertices without incoming arcs are the vertices of T_1, which is shown in Figure 7. Remove the arcs from this vertex.

Find vertices without incoming arcs and assign them a rank $\rho = 1$. Such vertices are T_2, T_3 and T_4. Remove arcs from vertices. Figure 8 represents results of 3rd stage.

Find vertices without incoming arcs and assign them a rank r =2. Such vertices are T_5 and T_6. Remove arcs from vertices. In Figure 9 shown results of 4th stage.

Find vertices without incoming arcs and assign them a rank r =3. Such vertex is T_7. Remove arcs from vertex. In Figure 10 shown results of 5th stage.

Find vertices without incoming arcs and assign them a rank r =4. Such vertex is T_8. Remove arcs from vertex. Figure 11 represents results of 6th stage.

Find vertices without incoming arcs and assign them a rank r =5. Such vertex is T_9. Remove arcs from vertex. Figure 12 represents results of 7th stage.

Find vertices without incoming arcs and assign them a rank r =6. Such vertices are T_{10} *and* T_{11}. Remove arcs from vertices. Figure 13 shows results of 8th stage.

Find vertices without incoming arcs and assign them a rank r =7. Such vertex is T_{12}.

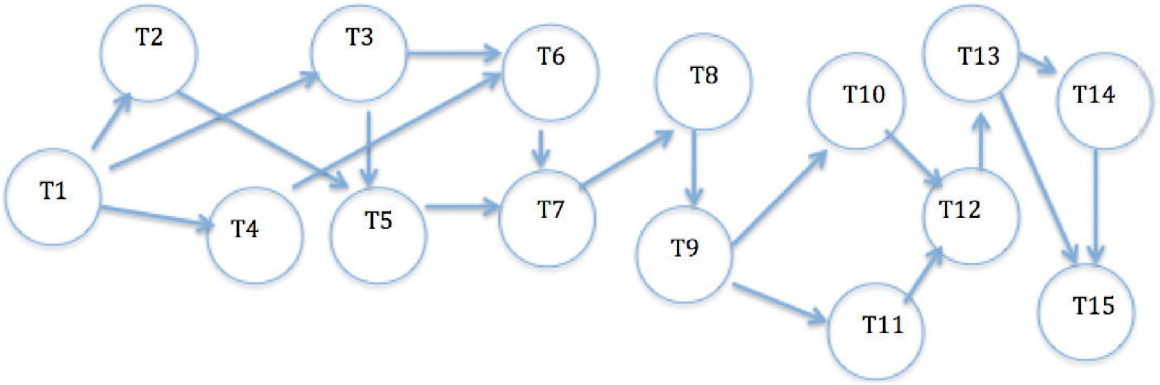

Figure 6 - Source infinite graph G_T

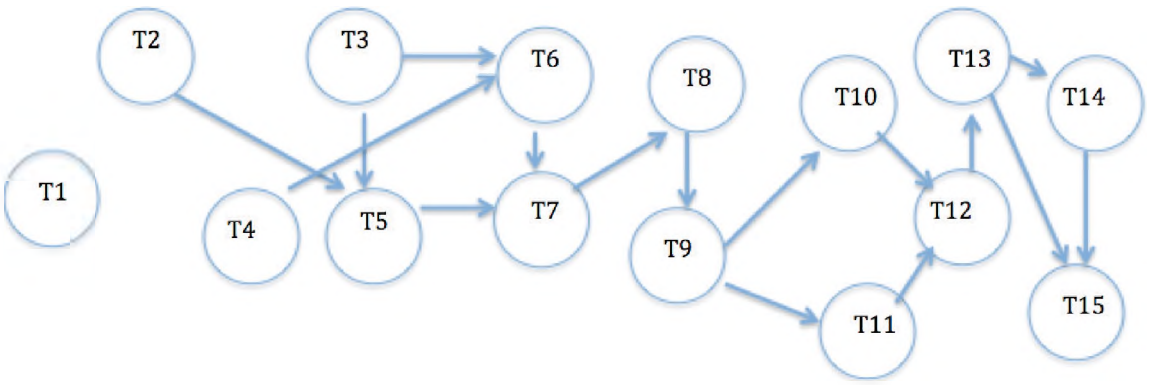

Figure 7 – Results of 2nd stage

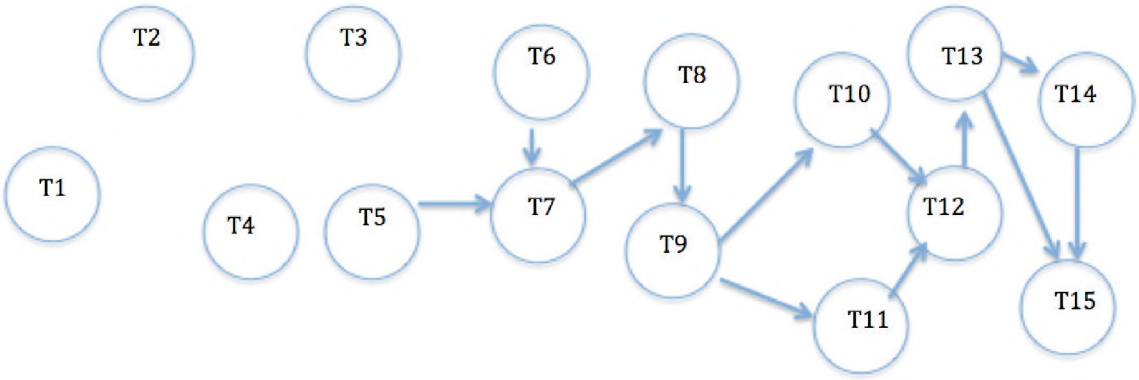

Figure 8 – Results of 3rd stage

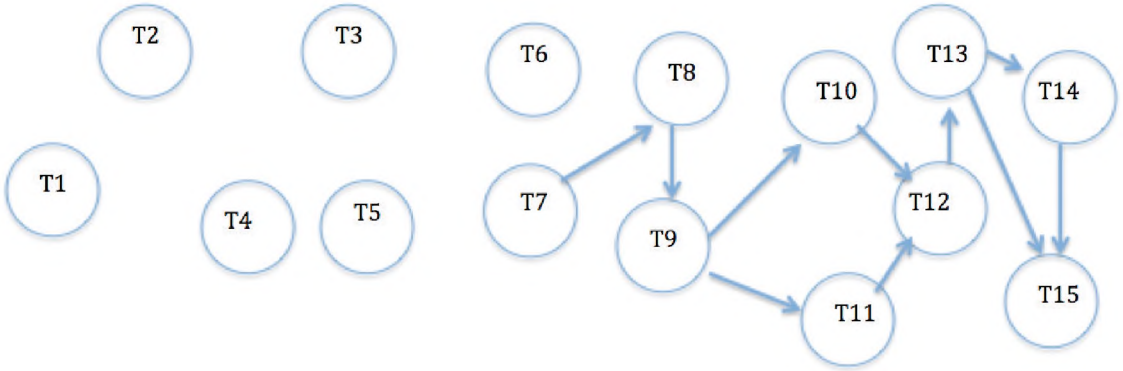

Figure 9 – Results of 4th stage

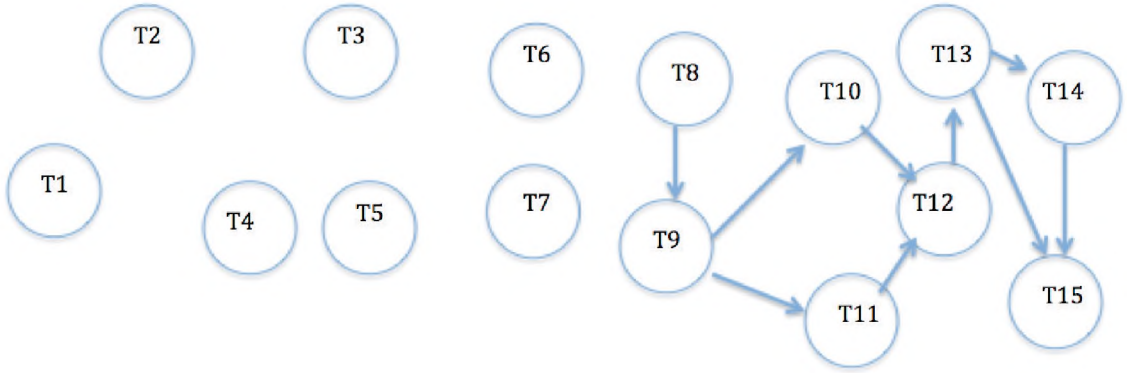

Figure 10 – Results of 5th stage

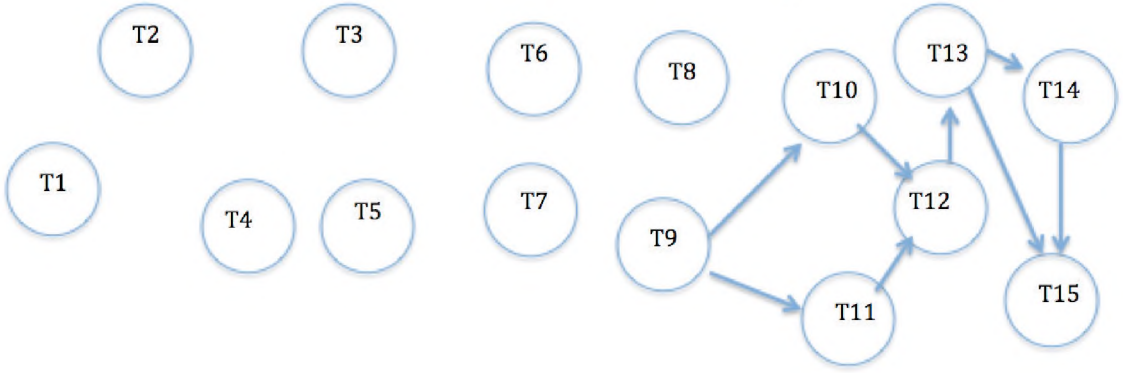

Figure 11 – Results of 6th stage

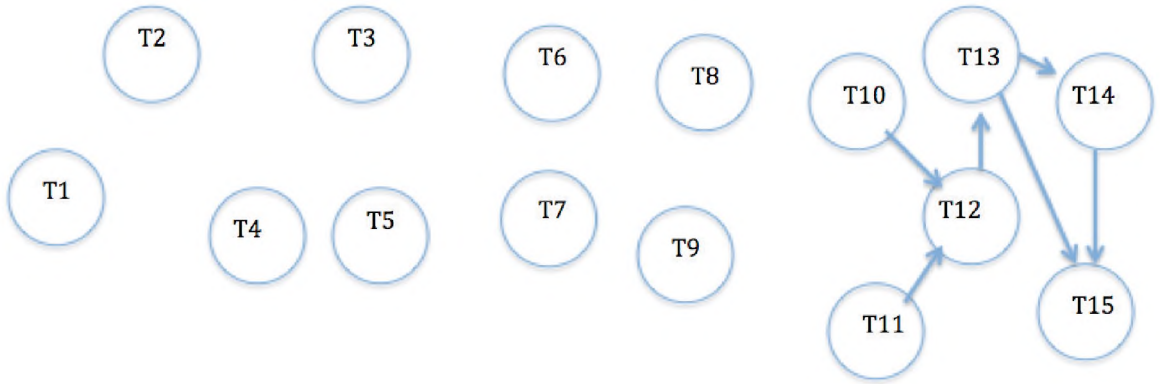

Figure 12 – Results of 7th stage

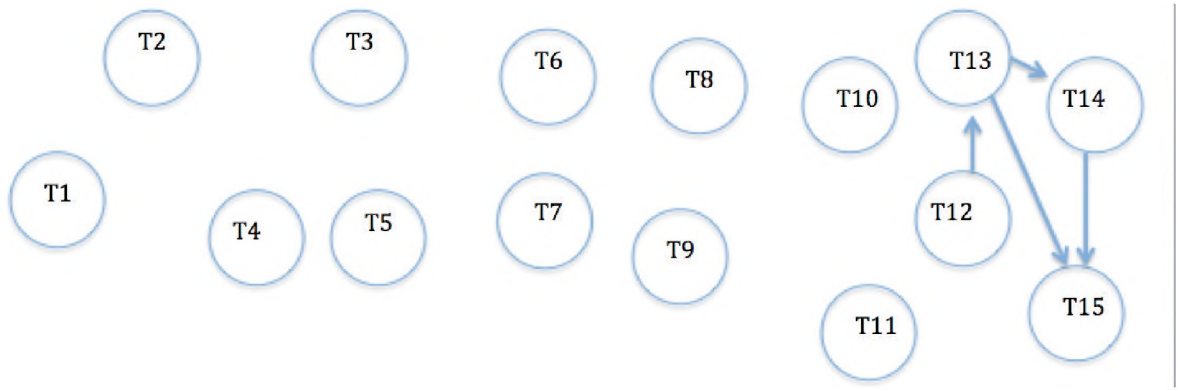

Figure 13 – Results of 8th stage

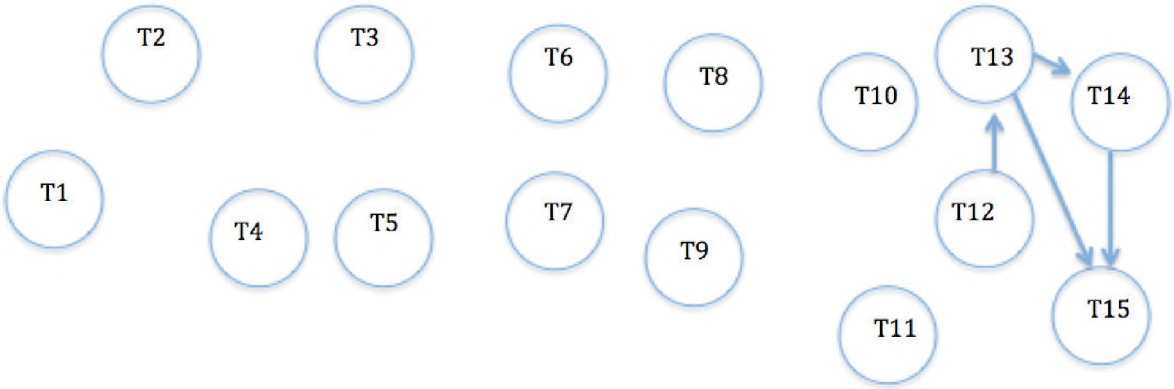

Figure 14 – Results of 9th stage

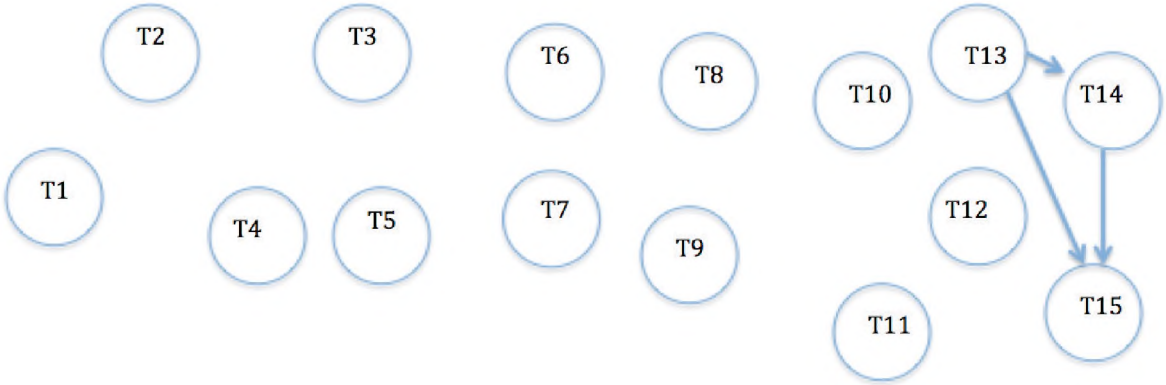

Figure 15 – Results of 10th stage

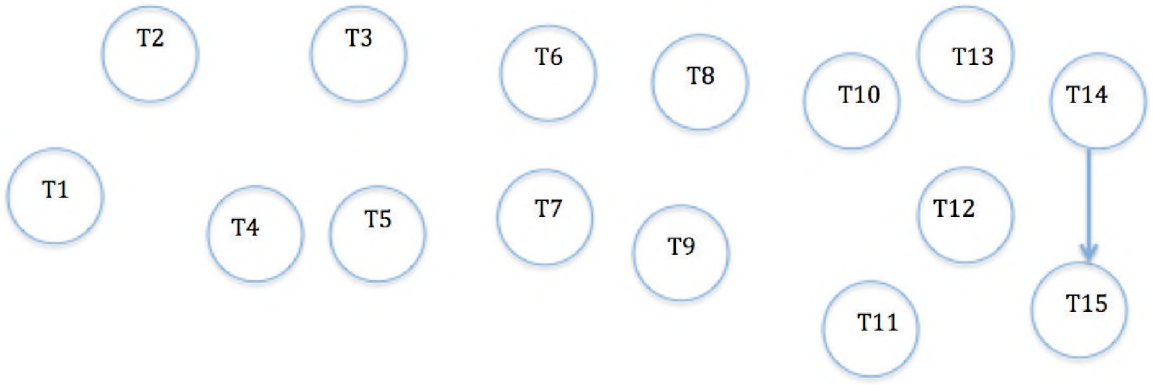

Figure 16 – Results of 11th stag

Remove arcs from vertex. Figure 14 shows results of 9th stage.

Find vertices without incoming arcs and assign them a rank $r = 8$. Such vertex is T_{13}. Remove arcs from vertex. Figure 15 represent results of 10th stage.

Find vertices without incoming arcs and assign them a rank $r = 9$ и $r = 10$. Such vertices are T_{14} and T_{15}. Remove arcs from vertices. Figure 16 represent results of 11th stage. Graph is presented hierarchically, as shown in Figure 17.

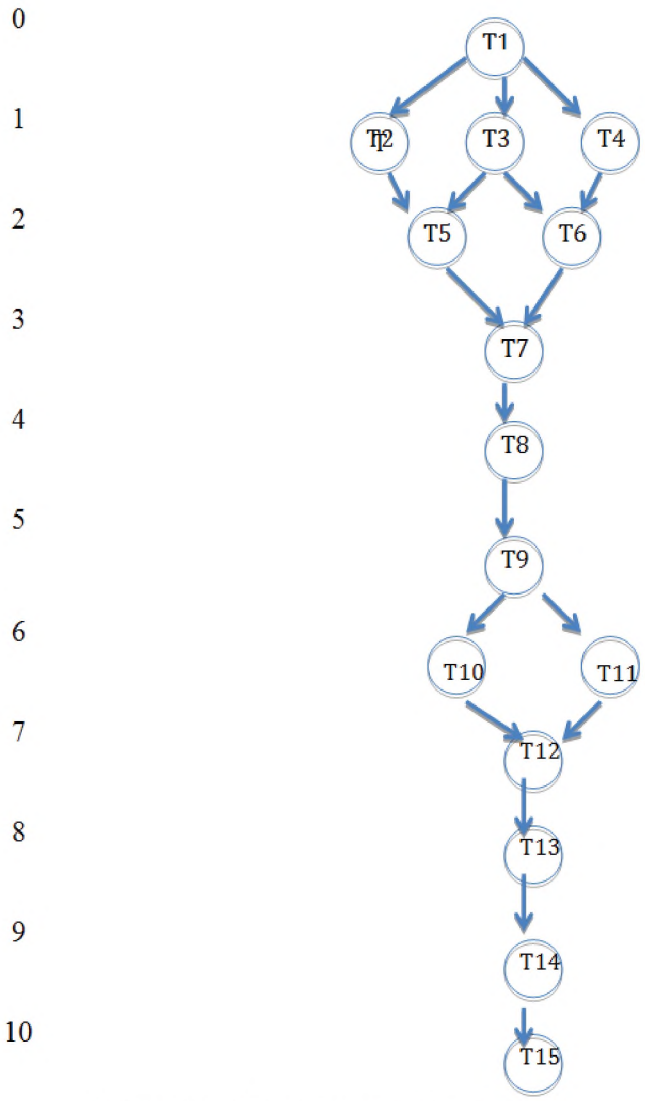

Figure 17 – Graph is presented hierarchically

CONCLUSION

As a result of research, it is planned to obtain an algorithm for the formation of content for an educational system for distance learning, which is adapted for each student, taking into account its features. On the basis of the developed algorithm, an adaptive online educational process is being developed, according to which the forms of education for people with disabilities and persons with disabilities will be developed and alternative forms of content presentation will be created for them. The development and implementation of an online process will make it possible to abandon expensive foreign training systems. As a result of the project, the principle of managed interactive self-education will be implemented, which leads to a decrease in the destructive effects of ICT on students' cognitive and social activities.

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