Constant water circulating ecological influence and remote English education system development based on sequence matching

Xiaohuan Zhang

Abstract
This article discusses the development status of sequence matching and closed-loop detection, and focuses on the inherent problems in closed-loop analysis methods. By analyzing the basic theory of sequence matching and the closed-loop detection implementation method of each sequence matching is summarized, and detailed closed-loop components corresponding to sequence matching are summarized, and the existing methods for achieving different modules are summarized and their disadvantages are reviewed. In line with this, this paper focuses on the focus on the central Z Basin area of the H River domain. Combined with systematic analysis of surface water and groundwater conversion characteristics, the Z Basin annual water balance model is proposed, and the relationship between surface water and groundwater is further explained. The annual water balance model contains a nonlinear model of water circulating ecology, which fully considers the runoff of rivers under river water abundance changes and irrigation on water cycle ecology. Finally, this paper proposes a remote English education system based on JavaBean components and software architectures. After comprehensive, extensive testing and research, it reduces software development costs under this field, not only improves system reliability, but also shortens the development cycle, simplifies system maintenance measures, and ultimately makes the maximum extension and stability. With regard to system testing, a complete test will be performed through web test methods and cookie laws, performance, feasibility, compatibility, and security. This article uses a variety of test methods, a variety of test content, through comprehensive testing, which fully meets the expected requirements, promoting the system to fully meet the ability of daily learning and work requirements.

Keywords Sequence matching · Water circulation ecology · Teletext · Education system

Introduction
Based on the lack of closed-loop sequence matching methods, this paper has been deeply studied from the two aspects of the scene sequence matching and closed-loop decision model (Agwa et al. 2020). First, by analyzing the disadvantage of the traditional image sequence matching method of the image acquisition method, the advantage of the neural network in image imaging is proposed, and an image capturing method based on the mixing of the CNN and VLAD features is proposed (Al-Hadithi and Hilal 2016). Then, the mapping shape of the neural network intermediate layer is then expanded by a set of contour vessels, and the local spatial properties of the image are retained, and the extended vector feature is created after using the VLAD; then, the result dimension of the PCA encoding is extracted, and the last portion of the vector feature is used as the image description (Almusawee 2012). Based on this point, this paper investigates the impact of human activities on the downstream natural environment in the water circulation ecological and H River domain in accordance with the model data in the Hhei. The reflux of irrigation water should be migrated to the thick layer area in the river, and the average operation is over 5 months before reaching the groundwater, which will cause the second replenishment of groundwater; the researchers said that the release of Z gorge has a strong negative correlation with the irrigation activity ratio (irrigation substitution ratio with river flow), but a weak positive correlation with the irrigation substitution rate (Al-Salem et al. 2009). In order to
suppress the increase in irrigation water, the sewer system can be used to prevent penetration, thereby effectively reducing the surface water rolling flow. With the implementation of the Hberough water-water project, in addition to the part of the Hheigan, the underground water level in most regions has a stable rise (Arel and Aydin 2018). The increase in river water flow has affected the river area, and the underground water level is generally upward. Finally, this paper fully introduces how to use J2EE software tools, B/S architecture models, UML modeling ideas, and other technical methods to design a distance English education system. This article completes analysis, design, implementation, and testing in the order of basic software development (Awang et al. 2016). The system is based on an Internet-based remote English education system, which uses the four-level J2EE system architecture, based on the B/S model, and the system has good reliability and scope of application. The system identity mainly includes system administrators, teachers, and students, and each of them performs proper management and use (Barros et al. 2007). The system should include user registration systems, teacher training systems, student learning systems, training management systems, and other modules (Bengar et al. 2020). Firstly, it analyzes the importance of research and the understanding of internal and external current situation. From the perspective of system architecture, workflow and database, this paper analyzes and implements many practical modules, including the simulation and implementation of online listening, online testing, online reading, online writing and online user registration learning modules (Bennett and Young 1998). The function, performance, reliability, consistency, and security of the system have passed the complete test flow of the Web, cookie, and other test methods (Foti 2011).

Materials and methods

Data source

With the GIS software to identify the digital terrain, the 25 subfields in the Q Mountain H River Basin were subdivided. In view of the main rivers of H River, it is divided into three sub-basins, respectively, by Mshan, Q Mountain, and Y Shanshui Station (Gamstedt and Östlund 2001). For the average annual flow of the mountain rivers, the observatory is mainly relying on observation data from 1956 to 1995, while the observed station is based on the relevant hydrological data (Ghemouti et al. 2015).

Architecture design of sequence matching

The closed-loop decision model is an important part of the detailed closed loop, which has a significant impact on the accuracy and efficiency of the detected closed loop. This chapter uses time topology landscape image information to design a closed-loop decision model suitable for sequences (Guerrero et al. 2013). A small similarity matrix is constructed according to the similarity between the observation mine and the map information history view, and the closed loop is determined according to the matrix of the minimum similarity (Ismail and Al-Hashmi 2008). Here, the closed-loop decision model framework is based on the sequence, as shown in Figure 1.

Land water circulating model design

On the basis of previous research, the model of the Z Basin monthly water conversion process was established, and two monthly water balance models were proposed. The same is true for the three-cylinder model of simulating groundwater and surface water conversion processes (Iucolano et al. 2013). However, the two use different solutions to imitate the export traffic of the Zhou. Model (a) uses the current water balance method; model (b) is based on balanced water method in the emission area (Jones and Façaaour969). In the seepage zone and irrigation zone under the river (canal), the migration of internal water is different, and the delayed characteristics of groundwater supply are also different. Therefore, two water tanks are used in seepage S1 and S2 to describe the intermediate process of change between surface water and groundwater. S1 receives the FS penetration from the water flow and the channel, the groundwater supply amount is RG1, and the control parameter of the water tank is a1; S2 receives the input terminal Fi of the irrigation returned water, the supply amount of groundwater is RG2, and the control parameter of the water tank is A1, T1. The water balance equation of the underground water tank is:

\[
\frac{dS_g}{dt} = R_g + R_g - Q_w - Q_d
\]  

The equilibrium equation of QD and underground storage can be expressed by the water level HK in the observation hole K (as in the formula 2, 3):

\[
Q_d = \omega_g (S_g - S_{g0}) \tag{2}
\]

\[
ds_g = \varphi K dH_K \tag{3}
\]

\[
Q_d = \omega_g \varphi K (H_K - H_{K0}) \tag{4}
\]

\[
\varphi_K \frac{dH_K}{dt} = R_g + R_g - \omega_g \varphi K (H_K - H_{K0}) - Q_w \tag{5}
\]

The increase in the supply of groundwater directly determines the dynamics of the groundwater level. Therefore, by simulating the water level in a typical hole, it can be used to adapt to the actual water level, and the transformation process of groundwater can be verified by using the reliability and scientific nature of three surface water tank models.
**Results**

**Studying region hydrological characteristics**

The variability of spatial changes on the water is not as strong as precipitation. The average distribution characteristics of the Yellow River Water Conservancy committee (based on E601 evaporative container) have been digitally used to extract evaporation data from the water surface. The same processing as precipitation in ENVI software is performed to obtain weighted water vapor in this area. The spatial feature of the rainfall distribution in the mountain area is shown in Figure 2.

The evaporation distribution characteristics of the spatial surface of the mountain Q in the mountain Q are shown in Figure 3.

Table 1 summarizes precipitation, evaporation amount, and flat altitudes per sub-basin.

**Land water circulation simulation prediction**

The analog time period is selected based on the data of each variable in the annual water volume balance model. Table 2 summarizes variable data for the annual water balance model.

The thickness of Africa in the Z Basin is changed. In this simulation, the average thickness is 100 m, which is a vertical limit of the passage leak replenishment profile model, and the horizontal range is 50 m (Fig. 4). The simulated area is divided into a rule of triangular elements (Figure 4). The two left nodes at the top of the model are the constant limits of the water head, imitating the water level; all nodes at the bottom of the model are the constant limit of the water head, imitating the dive surface; the peripheral node is the edge of zero flow, and the simulation period is 100 days.

As can be seen from Figure 5, in an incomplete area of the river, the river is mainly concentrated. During the simulation, the moisture formed by the river into the horizontal direction...
may affect up to 26.22 m (i.e., x=26.22 m) in the horizontal direction. The amount of permeation obtained at a depth in the section must be equal to the flow at all nodes at the depth. The research course process is changed, below the model limit is the deep water tank, which belongs to the saturation region. The unchanged area at the top of the flume absorbs water from the surface of the phreatic layer through capillary action, and the capillary area is saturated. Therefore, the flow time variation curve at the depth of 90 m (z=90 m) is modified and used as the process of changing groundwater recharge.

As can be seen from Figure 6, it is clear that the groundwater filling is clear during the lag of the water flow. From the 11th day, groundwater changes. Due to the thicker region of seepage, the maximum supply value is far below the maximum flow exhaust value.

As can be seen from Figure 7, the submersible start time that starts receiving additional irrigation benefits is obviously after the top dive time. The larger the thickness of the air area, the longer the time required to delay filling.

Affects by the decrease in surface permeability, the front wet surface of the irrigation water penetration has a significant expansion process, and after reducing surface penetration, the front surface is significantly contracted (Fig. 8).

Analysis of groundwater circulating ecological effects

Before and after the water, the water flow rate calculation results are shown in Table 3.

The groundwater balance table before the water is toned; see Table 4.

As can be seen from Table 4, the groundwater system before the water transfer is in a negative equilibrium state, but the balance variance is equally sparse. Therefore, this paper uses constant current to simulate the groundwater flow field before the water-watering, and uses the flow field as a water supply. This model performs ground flow field prediction in the context. After the water is toned, other factors are added to the groundwater in addition to the amount of river diameter,

Table 1 Main river parameters of Q Mountain H River

| Basin name                        | Numbering | Water area A (km²) | Average altitude h (m) | Average precipitation P (mm) | Average evaporation E₀ (mm) | Many years average runoff R (10⁸ m³/a) |
|-----------------------------------|-----------|--------------------|------------------------|-----------------------------|-----------------------------|---------------------------------------|
| Upper reaches of H River          | 0         | 10009              | 3514                   | 475                         | 772                         | 15.98                                 |
| H River - Z Mountain              | 1         | 4589               | 3897                   | 491                         | 765                         | 7.102                                 |
| H River - Q Mountain              | 2         | 2452               | 3405                   | 505                         | 775                         | 4.363                                 |
| H River - Y Gorge North           | 3         | 2968               | 3240                   | 426                         | 792                         | 4.515                                 |
| T River                           | 4         | 6883               | 3759                   | 433                         | 901                         | 6.23                                  |
| H River                           | 5         | 1570               | 3504                   | 440                         | 874                         | 2.55                                  |
| H River                           | 6         | 117                | 3455                   | 320                         | 1095                        | 0.173                                 |
| F River                           | 7         | 135                | 3345                   | 382                         | 1007                        | 0.154                                 |
| F River                           | 8         | 568                | 2778                   | 441                         | 856                         | 0.94                                  |
| Y River                           | 9         | 75                 | 3088                   | 376                         | 1079                        | 0.066                                 |
and the amount of groundwater extraction remains unchanged, and the constant flow is still used to simulate the groundwater flow field after the water supply.

### Discussion

#### Background analysis of English distance education system

Modern distance education features two-way interactions, i.e., interactive and exchange between people and computers, which not only strengthens the communication between teachers and students, but also inspires and improves collaboration between students’ self-study ability and students.

As a backend support system for online education, China’s online education platform has also been developed accordingly (Khatab et al. 2019). Many systems and actual products have developed three main systems required for online education systems: for the development of teaching support systems (simultaneous teaching and loss of teaching), teaching management system, and course materials teaching system. However, from the current online system and educational products, there are some shortcomings to a certain extent, especially for telegrams of English.

#### Weak interaction

Current remote education products have a certain form of activity interaction (simultaneously or out of time), but its functional part is missing. To continue your distance education, educational institutions need to further update their educational concepts, and display more important interactions with distance education from the order of curriculum structure and content: interaction with learning and the content of the course itself (Liguori et al. 2014).

---

**Table 2** Annual equilibrium model each input variables

| Era | Qm   | Qi   | Qw   |
|-----|------|------|------|
| 1995| 22.94| 14.25| 1.96 |
| 1996| 26.64| 14.91| 2.04 |
| 1997| 21.62| 14.44| 2.12 |
| 1998| 30.99| 15.14| 2.2  |
| 1999| 24.54| 14.28| 2.28 |
| 2000| 23.15| 14.84| 2.36 |
| Average| 25.18| 14.24| 1.60 |

---

**Fig. 4** Leakage replenishment section mesh score and water content distribution of the 30 days

**Fig. 5** Simulation of water content distribution in leakage profile in the 15D river
The system is poor and small Most remote education systems have varying degrees of scalability, network load balancing, and need responsiveness. Most of the systems are small- and medium-sized, which cannot be satisfied with large applications.

Poor sharedness Although current network technology provides basic technical conditions for short-term education resource sharing (e.g., through HTTP and HTML) and learning activities (e.g., through various communication tools), it is allowed to use teaching resources; knowledge exchanges in teaching skills and courses rarely meet the standards of exchange management level, which hinders more shared and exchange opportunities for teaching resources (Lothenbach et al. 2011).

Personalization The biggest difference between online education and classroom education, or one of the more attractive functions, is that personalized education can be realized. Not only that, students can learn from their own interests, hobbies, time, and other independent organization. By choosing familiar content, teachers can propose appropriate recommendations based on learning levels, skills, and other factors (Nematzadeh et al. 2020). Today, most remote education systems do not have this function, actually just a copy of classroom education.

Intelligent understanding In the existing education system, there is a lack of guidance for users, and it is impossible to intelligently improve learning strategies to adapt to the situation of learners.

Necessity for English distance education system

Construction and improvement of relevant university teaching resources are the foundation of distance education; teaching materials are the foundation of network education. The construction of teaching materials and online courses is facing many challenges; teaching methods and management systems must conduct corresponding changes to adapt to such changes and basic organizations, which are implemented through specific courses. The basis of education computerization is a reasonable configuration of teaching resources, which is a systematic engineering that requires long-term maintenance and construction. Due to the diversity and complexity of teaching resources, there are different understandings, so there are
many different levels and value teaching resources, which makes it difficult to use and manage, making it difficult to cause various problems and system levels.

The key to the above problems is the lack of comprehensive, systematic analysis and research on the distance learning environment, thereby ignoring the changes in teaching concepts and the needs of users in the environment. As a result, research on the Internet Distance Education System cannot stay only in the simulated real class, which is only available on the Internet, but to provide complete environmental benefits to the Internet, providing a targeted online learning system. In addition to the teacher's teaching experience, navigation is carried out in the learning process, so that students become the main body of learning, and teachers should understand how to adapt to the students’ personal abilities for teaching.

Therefore, in order to more fully discuss the characteristics of modern remote learning activities, this paper proposes a web-based approach to design a personalized web teaching system.

**English distance education system design goals and performance demand**

English distance education systems are based on the current model of online teaching system development and related technologies in accordance with the Internet, and analyzes the teaching methods of modern distance education and construct the basis of remote network education support platform.

---

**Table 3** Downstream Black River leakage calculation

| Year     | Whistle Dry reach | Langxin mountain | House - positive flow loss | Wolf - whistle flow loss | Overall loss | River water infiltration |
|----------|-------------------|------------------|----------------------------|--------------------------|--------------|-------------------------|
| 1998     | 11.21             | 8.5              | 5.2                        | −2.7                     | −3.2         | −6                      | Zhengshao reach 1.66 |
| 1999     | 7.01              | 4.3              | 3.2                        | −2.7                     | −1.1         | −3.8                    | House - Wolf Section 1.09 |
| 2000     | 6.61              | 3.9              | 3                          | −2.7                     | −0.9         | −3.6                    | East River 2.7         |
| 2001     | 2006-01-01        | 3.8              | 2.2                        | −2.3                     | −1.61        | −3.9                    | West River 0.86        |
| Average  | 7.74              | 5.1              | 3.4                        | −2.6                     | −1.7         | −4.3                    | Total 6.31             |

---

**Fig. 8** Irrigation regression replenishment simulation results
Supporting teachers’ teaching and conducting new design models and progressive ideas for students, the learning process has introduced more autonomy and interactivity, and provides a framework solution for modern distance education. Its main modules are:

- **User registration system**: student online registration, verifying the legality of the user and confirming the permission of the user role.
- **Teaching management system**: responsible for administrative tasks for the entire system. Different administrators have different permissions. Administrator management systems include staff management, course management, job management, examination management, question and answer management, forum management, and other modules.
- **Student learning system**: first understand online learning, homework, online self-examination, classroom, and online discussions and answers.
- **Teacher training system**: information and online teaching network, course, online test, online question and answer, online communication, and other whole processes.

In order to solve the system scalability problem, this topic is designed and implemented on the J2EE platform. Based on this framework, this paper makes a specific analysis and design of the online examinations of the teacher training system. With a distributed system structure based on multiple J2EE levels, all features of the remote education system are performed by an interaction between application servers and user browsers.

### English distance education system functional structure

The system identifies the functions of remote learning, student assessment, and questions through the Internet, as well as teachers to answer questions remotely, issue test issues, and manage students. Depending on the desired analysis, the system should include student registration modules, student assessment modules, question and answer modules, teacher registration modules, and question AC modules.

### Student registration module

This module has a student registration submodule and a student contact sub-module. Student registration submodules can realize the latest student registration information. After the student registration, they can enter the student module and use online exams and online messages. After registration, students enter accounts and passwords. For accounts that are not available on the student’s class, the registration is successful, and for the already used account, the registration failed, you must enter a new account. In fact, the registration program here will add new registration to the student member table. The new record temporarily records the student account and password field. After students log in and enter the student module, additional information can be used to fill out other student information fields.

Student login module enables registered student users to enter the corresponding user information module by filling out the correct username and password. The illegal login behavior of the user will cause the system to warn, and the wrong password will be alerted.

### Student message module

This module has two submodules: leave a message and view the message student module. The student messaging submodule is mainly used by students to leave the news to the responsible teacher. If the student has questions about the content of a specific course, they can leave a message to the course and help students solve the problem through the teacher’s reply information. The submodule displays a message to find the teacher’s message and respond to the student’s message.

### Student exam module

Students can participate in online exams and online score records through this module, and the test results are automatically recorded in the score table. After the teacher releases the test problem, the students enter the test module, and then the system selects the problem from the problem library. After the student fills in the student identification number, it will start answering the question after the relevant program is handled and submit the test paper. The system automatically compares students’ submitted answers and compares their answers to the corresponding test questions in the research questionnaire, and finally records the results of the student test score.
Results query module

Every time the results of the online exam are recorded in the student score database, students can enter the student registration number at any time and view their scores within the test time. If you only enter a student’s identity number, you will query all the results of the student. If the student’s status number and the test time are entered, the records that meet the two conditions will be rendered.

Teacher registration and message module

The registration module has an accompanying teacher registration submodule and teacher contact submodule. The specific functions of the record and message module are divided into student message mode and message mode.

Test problem publishing module

Through this module, teachers can release test problems and arrange jobs. This module actually adds database records to research issues, and adds fields and test issues, text input, test answers, etc.

Student state management module

This module includes student information retention submodules and teacher information retention submodules. After registration, students can fill in their own information, and teachers can manage students’ registration numbers. Among them, students with a school number can use advanced features such as online exams.

Application measures in adult English education

In order to apply remote education to English adult education, it is first necessary to implement online teaching creation conditions from three aspects: First, build hardware. At present, China has first established a remote education network that connects computer and satellite networks and covers the country; second, software development. The need to create online courses and digital textures is currently relatively mature; third, potential part of construction. Establish a completely computerized distance education theory and method. Therefore, English adult education can use a distance learning model to improve teaching quality and effectiveness, and help adult learners learn English well.

From the details, you can reflect the application of distance education in English adult education from the following aspects:

Remote learning is based on a network environment, which makes adult learners occupy the most important position in English learning, so their learning motives directly affect the quality of learning. Unlike traditional English teachers, online teaching requires teachers to take responsibility for navigation, testing, service, and guidance to help students fully develop or achieve their goals as the core, and create a good learning environment. This shows that the implementation of distance education is gradually affecting students’ concept of learning, which has enabled them to establish a new idea of open, independent, and cooperative learning. On the other hand, with the rapid development of information education, the same level of English and information technology will become the knowledge and skills that people need to be mastered. In the process of adapting to the distance learning mode, students will gradually recognize the importance of information technology and English learning, which will provide powerful inner motivation to stimulate and adapt to English learning capabilities.

There is a clear connection between English teaching, that is, the interaction between things and learning environments. The network environment provided by distance education has created favorable conditions for interactive teaching, and helps to develop students’ advanced language thinking; for example, various functional system software can improve interactivity and immerse a clearer, more distracting, and more actual language learning environment. In addition, distance education may better provide students with learning support services. “Learning Support Services” classifies students as subjects, designs teaching activities, and manages students’ self-learning and self-learning teaching, and provides a series of comprehensive services, including consulting, communication, and problem solutions. It is supported by the information technology law, focusing on improving the quality of service, and is designed to give students’ wishes to satisfy (ASTM 2009). Through continuous optimization and improvement, it can help adult learners increase their learning efficiency. Of course, the benefits of distance education can also be seen from the changes in teachers’ roles. Different from traditional education, teachers who use remote learning models can rely on the Internet to encourage students to stimulate their spirit in real time, and guide them to gradually eliminate the uncomfortable feelings generated during the learning process. They can provide effective guidance for students and help them conduct specific learning. Students learn and understand English-speaking knowledge, create a scientific and personalized learning method for students, and gradually abandon the traditional English teaching methods. In view of the fact that most adult students learn English, teachers can use remote learning models to help students plan and manage their learning time, such as studying important content every day, and study important on weekends and holidays to improve students’ learning efficiency. At the same time, teachers can also use the convenience of network media, contact adult students anytime, anywhere to help them overcome the fear of adversity, and encourage them to continue.
Applications in English adult education can also be seen from the development of high-quality teaching resources. If you simply organize, summarize the paper resources, then transfer it to the Internet to form a network resource, it is difficult to play an innovative, interactive, and open online teaching. In fact, adult learners are more accustomed to centralized interactive teaching, and there are not many people who are actively involved in online learning, but this does not mean that online education is meaningless. Instead, there is inevitable online teaching resources, which is very helpful for adult learners to learn English, and make adults adapt to teaching models as soon as possible, so that students use distance education model to improve their English learning level.

Conclusion

Firstly, starting from the different properties of high, medium and low areas in H River Basin, this paper designs the models and simulation diagrams on high, medium and low areas respectively, and takes the water cycle in H River Basin as the research object to determine its model and its response to human activities. The effects of the middle and lower partial research results of the model have always been more obvious in human activity on the inhabitants in the H River area. Finally, this paper provides an English remote learning system that carefully studies the teaching characteristics of university networks and related business processes before software development, and lays a good foundation for the ease of use and reliability of the system. This paper starts with the possibility of related analysis: the application process is summarized from the perspectives of case analysis, business process summary and system summary, which lays a foundation for the further work of the system. In terms of design calculations, this paper is done in the order of software basic development process, including “Analysis, Design, Implement, and Test.” The system mainly includes user registration system, teacher training system, student learning system, teaching management system and other related modules. After completing the pre introduction of the system composition, this paper makes a detailed post composition analysis of the business functions of the system, and fully explains the implementation mode, function help, system interface and practice between each module, which lays a foundation for the integrity verification of the whole system process.

Declarations

Conflict of interest The authors declare that they have no competing interests.

Open access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution, and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article’s Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/.
Guerrero LA, Maas G, Hogland W (2013) Solid waste management challenges for cities in developing countries. Waste Manag 33(1):220–232

Ismail ZZ, Al-Hashmi EA (2008) Use of waste plastic in concrete mixture as aggregate replacement. Waste Manag 28(11):2041–2047

Iucolano FL, Ba Caputo D, Colangelo F, Cioffi R (2013) Recycled plastic aggregate in mortars composition: effect on physical and mechanical properties. Mater Des (1980-2015) 52:916–922

Jones R, Façaoaru I (1969) Recommendations for testing concrete by the ultrasonic pulse method. Mater Constr 2(4):275–284

Khatab HR, Mohammed, Samaher J, Hameed, Laith A (2019) Mechanical properties of concrete contain waste fibers of plastic straps. In: IOP Conference Series: Materials Science and Engineering, 2019. IOP Publishing, Bristol

Liguori BI, Capasso F, Lavorgna I, Verdolotti M, Letizia (2014) The effect of recycled plastic aggregate on chemico-physical and functional properties of composite mortars. Mater Des 57:578–584

Lothenbach B, Scrivener K, Hooton RD (2011) Supplementary cementitious materials. Cem Concr Res 41(12):1244–1256

Nematzadeh M, Shahmansouri AA, Fakoor M (2020) Post-fire compressive strength of recycled PET aggregate concrete reinforced with steel fibers: optimization and prediction via RSM and GEP. Constr Build Mater 252:119057