

**LAPORAN PENELITIAN
TAHUN ANGGARAN 2023**

Pengaturan Kesulitan Dinamis Berbasis Capaian Pemain Pada *Serious Game* Pendidikan Islam dan Lingkungan Hidup (SGPILH) Sebagai Media Alternatif Belajar Pada Madrasah Ibtidaiyah

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Tanggal	:	30 November 2023
Satker	:	(423812) UIN Maulana Malik Ibrahim Malang
Kode Kegiatan	:	(2132) Peningkatan Akses, Mutu, Relevansi dan Daya Saing Pendidikan Tinggi Keagamaan Islam
Kode Output Kegiatan	:	(BEI) Bantuan Lembaga
Sub Output Kegiatan	:	(003) BOPTN
Kode Komponen	:	(004) Dukungan Operasional Penyelenggaraan Pendidikan
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UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM MALANG
2023**



HALAMAN PERSETUJUAN

Laporan penelitian dengan judul “Pengaturan Kesulitan Dinamis Berbasis Capaian Pemain Pada *Serious Game* Pendidikan Islam dan Lingkungan Hidup (SGPILH) Sebagai Media Alternatif Belajar Pada Madrasah Ibtidaiyah”

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Menyatakan dengan sebenar-benarnya bahwa dalam penelitian ini tidak terdapat unsur-unsur penjiplakan karya penelitian atau karya ilmiah yang pernah dilakukan atau dibuat oleh orang lain, kecuali yang secara tertulis disebutkan dalam naskah ini dan disebutkan dalam sumber kutipan dan daftar pustaka. Apabila dikemudian hari ternyata dalam penelitian ini terbukti terdapat unsur-unsur penjiplakan dan pelanggaran etika akademik, maka kami bersedia mengembalikan dana penelitian yang telah kami terima dan diproses sesuai dengan peraturan perundang-undangan yang berlaku.

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1. Judul

Pengaturan Kesulitan Dinamis Berbasis Capaian Pemain Pada *Serious Game* Pendidikan Islam dan Lingkungan Hidup (SGPILH) Sebagai Media Alternatif Belajar Pada Madrasah Ibtidaiyah.

2. Latar Belakang

Penanganan kerusakan lingkungan hidup oleh manusia sepanjang dekade terakhir, merupakan sebuah keharusan didukung dibentuknya PP nomor 22 tahun 2021 (Indonesia, 2021). Oleh karena itu, perlu sosialisasi sejak dini pada usia sekolah. Salah satu upaya untuk mewujudkan sosialisasi pada usia sekolah yaitu perumusan model belajar di era *new normal* (Ferdyan et al., 2021). Peneliti lain mengusulkan agar makin menyayangi lingkungan hidup berupa integrasi pelajaran pengetahuan alam di tingkat smp (Widiyatmoko, 2021). Selanjutnya dikaji lebih detail dari sisi bentuk pembelajaran sampai observasi perilaku siswa mengenai lingkungan hidup (Wihardjo & Rahmayanti, 2021). Dalam pendidikan islami, gagasan menumbuhkan dan mengembangkan rasa sayang pada lingkungan hidup, telah di rintis MIN di Bone dengan integrasi kurikulum PAI (Wardana, 2018).

Namun keadaan pandemi masih menghantui hingga kini, sehingga metode belajar memanfaatkan teknologi sudah pantas dipersiapkan, dengan mengajukan metode lain, disamping model pembelajaran menggunakan *e-learning*. Kelemahan penerapan *e-learning* menyebabkan kebosanan. Agar proses pembelajaran dapat menghibur, dapat dilakukan dengan menggunakan *game* (Windawati & Koeswanti, 2021). Supaya proses belajar terarah dan menyenangkan, diajukan *serious game* (Nugroho et al., 2019, 2021).

Guna meningkatkan efektifitas proses belajar mengajar, salah satu jalan terabas adalah menerjemahkan kurikulum yang telah diterapkan oleh MIN di Bone tentang pendidikan lingkungan hidup dan islam sebagai sebuah *serious game*.

Serious Game Pendidikan Islam dan Lingkungan Hidup (SGPILH), yang diajukan peneliti pada tahun 2022, mampu menumbuhkan kecintaan terhadap lingkungan hidup. Namun masih menyisakan kebosanan pada sisi siswa, karena tingkat kesulitan yang ditampilkan dalam SGPILH, menjadi monoton dan menyebabkan kejenuhan. Oleh karena itu, dalam penelitian lanjutan ini, peneliti mengusulkan pengaturan kesulitan, yang secara dinamis mengikuti capaian pemain.

Harapan yang hendak diraih melalui Pengaturan kesulitan dinamis pada SGPILH adalah, siswa tetap tertarik bermain, siswa semakin penasaran dengan *game*, siswa tetap dapat menikmati *game* dan merasa tidak monoton dan tidak mudah jenuh. Guna mencapai

pengaturan kesulitan secara dinamis, peneliti menggunakan *Neural Network* agar perubahan kesulitan yang dihasilkan bersifat alami.

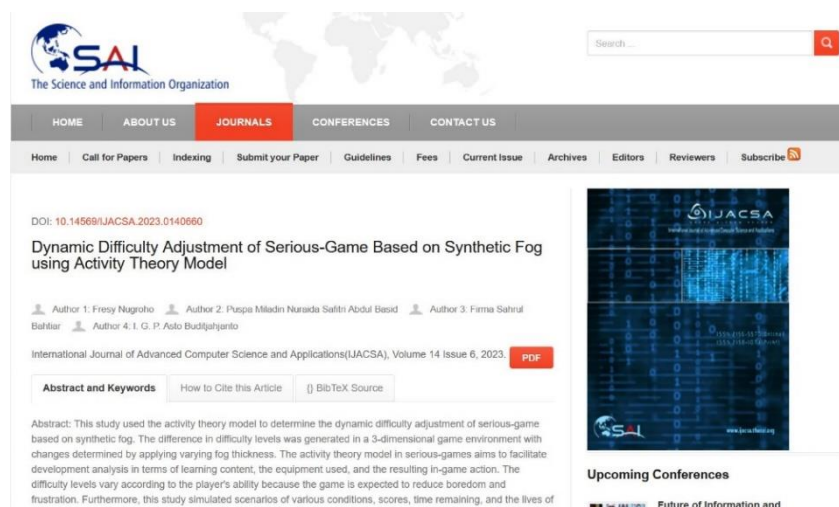
Capaian Luaran:

- 2 Jurnal Internasional terindex Scopus Q3 → 2 artikel sudah terbit di IJACSA Volume 14, issue 6 dan issue 8.
- 1 Konferensi Internasional (ICE2T 2023/ IEEE & Scopus) → sudah presentasi
- 3 Konferensi Internasional (ICEEIE 2023/ IEEE & Scopus) → 3 artikel sudah presentasi
- 3 Konferensi Internasional (ICGT 2023) → 3 artikel sudah presentasi, 2 dengan format Prosiding ICGT 2023
- 2 Artikel dengan Format Scopus IOP Series, sebagai tindak lanjut ICGT 2023.
- 3 Jurnal Nasional Terindeks Sinta 3 → status 1 jurnal in review, 2 jurnal submit
- Hak Kekayaan Intelektual → “Game Green Environment”, No. 000532197, Tanggal : 25 Oktober 2023.
- Buku referensi → sedang dalam proses

3. Detail Capaian Luaran :

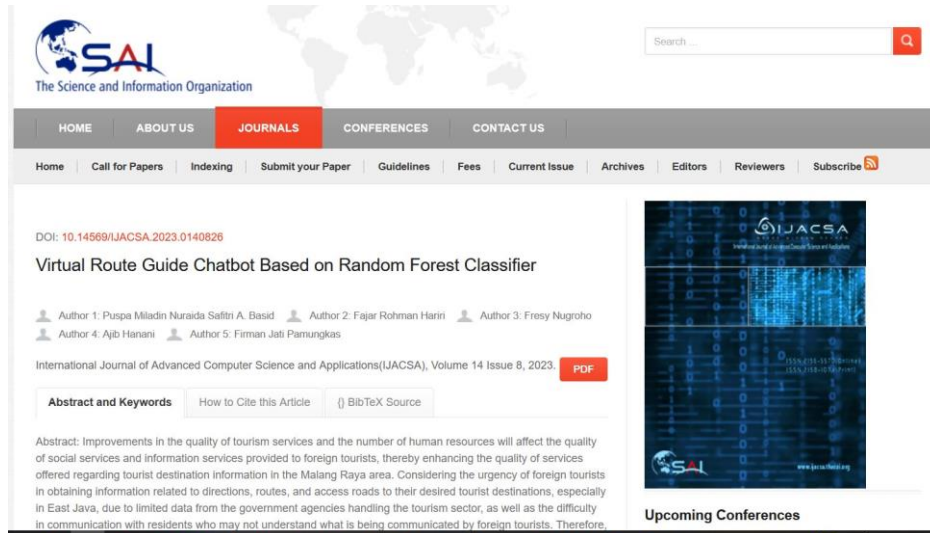
- 1) **Dynamic Difficulty Adjustment of Serious Game Based on Synthetic Fog Using Activity Theory Model**, pada jurnal *International Journal of Advanced Computer Science and Applications(IJACSA)* – Q3; SJR : 0,26; e-ISSN : 2156-5570; p-ISSN:2158-107X; Volume 14, No 6. 2023.

DOI: 10.14569/IJACSA.2023.0140660



The screenshot shows the article page for "Dynamic Difficulty Adjustment of Serious-Game Based on Synthetic Fog using Activity Theory Model" on the IJACSA website. The page includes the SAI logo, a search bar, and a navigation menu. The article title is prominently displayed, along with the authors' names: Friesy Nugroho, Puspita Miladn Nurada Saifin Abdul Besid, Firma Sahral Bahfar, and I. G. P. Asto Budjajanto. The article is published in the International Journal of Advanced Computer Science and Applications (IJACSA), Volume 14 Issue 6, 2023. The page also features a PDF download button, abstract and keywords sections, and a list of upcoming conferences.

- 2) **Virtual Route Guide Chatbot Based on Random Forest Classifier**, pada jurnal *International Journal of Advanced Computer Science and Applications(IJACSA)* – Q3; SJR : 0,26; e-ISSN : 2156-5570; p-ISSN:2158-107X; Volume 14, No 6. 2023. DOI: 10.14569/IJACSA.2023.0140660



- 3) **Engage Museum Experience Using Augmented Reality Based on Multimedia Development Life Cycle**, dalam The 4th International Conference On Engineering Technology and Technopreneurship (ICE2T 2023), “ Recovering Global Economy Through The Perspective of Engineering and Technopreneurship”, 15 & 16 August 2023, Perdana Kuala Lumpur City Centre, Kuala Lumpur, Malaysia.

Engage Museum Experience Using Augmented Reality Based on Multimedia Development Life Cycle

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Abstract—Multimedia Development Life Cycle (MDLC), to obtain an interesting experience about introducing objects in the Museum in Augmented Reality. This MDLC method comprises six stages: concept, engineering, material collection, assembly, testing, and distribution. Based on the trial, it is known that Augmented Reality could engage museum experience objects gets a positive response from users. Based on usability testing on respondents, 84.38% stated they were satisfied, and 83.24% of respondents stated that the resulting application was easy to use.

Keywords—MDLC, Engage, Museum, Experience, AR

technology [18] is one of the easiest options to implement. For example gamified participatory [4], virtual reality [19], multi-sensory [20], virtual reality [19], and augmented reality [18].

Augmented reality (AR) integrate virtual aspect over actual scenes. In this context, the actual world is combined with virtual component. AR supplements reality with extra information to increase and engage for museum experience, such as deepfake portraits [21], embodied virtual [22], collaborative browsing [23], context experience [24], or using mobile devices [25] integrate in the 3D virtual world.

- 4) **Classification Based On Texture analysis for Synthetic Hazy Image from Mount Kelud Haze Image Density**, dalam *The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE)*, “From Technology 4.0 To

Society 5.0”, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Classification Based on Texture Analysis for Synthetic Hazy Image from Mount Kelud Haze Image Density

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Congratulations, your paper:
ID Paper : 1570925820
Title : Classification Based on Texture Analysis for Synthetic Hazy Image from Mount Kelud Haze Image Density

has been ACCEPTED for the oral presentation.

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Abstract—This paper classifies the simulation of homogeneous synthetic images, heterogeneous synthetic hazy images, and original hazy images taken from CCTV (Close Circuit Television) of Mt. Kelud crater using the CLCM (Close Loop Co-Performance Matrix) method. The research focuses on removing the haze in the image [14]. Wang's research proposed illumination settings by considering color to remove synthetic haze and smoke in images with fire scenarios [15]. Meanwhile, Hassan's observation examines

5) Improved Color Attenuation Prior for Kelud Crater Image Dehazing, dalam The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), “From Technology 4.0 To Society 5.0”, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Improved Color Attenuation Prior for Kelud Crater Image Dehazing

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Congratulations, your paper:
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Abstract—Images that contain disturbances, such as haze, are very disturbing in the visibility of the image because they experience a reduction in contrast and color. In this study, we implement a system that can remove the effects of fog or noise. Therefore, the method used is expected to remove noise efficiently. The Improved Color Attenuation Prior method uses the Color Attenuation Prior principle. The output obtained is a information in the disturbed parts, so the color information can be utilized to repair the damaged image. This method can produce a better image with more accurate colors [6]. This method has been tested on various images and shows better image restoration results than other image restoration methods. The method can also be adapted to other problems in image restoration, such as image denoising and image

6) Recommender Selection System for The Game Using Bonferoni Mean Based TOPSIS, dalam The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), “From Technology 4.0 To Society 5.0”, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Recommender Selection System for The Game Using Bonferoni Mean Based TOPSIS

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Abstract—In this paper, a recommendation system is applied and factors associated with each vehicle option, enhancing

- 7) **Non-Local Haze Removal For Mount Kelud Hazy Image**, dalam The 13th International Conference on Green Technology (ICGT), “Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future”, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

Non-Local Haze Removal For Mount Kelud Hazy Image

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Abstract. Mount Kelud is one of the active volcanoes located in East Java, Indonesia. Monitoring conducted through closed-circuit television (CCTV) is the activity to observe the volcano's activity. However, the images displayed by the CCTV are often inaccurate due to dense haze. There are several methods for haze removal to improve the degraded image quality caused by these issues, one of which is Non-Local Dehazing. The Non-Local Dehazing method has several advantages that can overcome the shortcomings of other haze removal methods, such as producing more consistent images under various lighting conditions. This study uses images of Mount Kelud taken over a period of 10 days from October 3, 2017, to October 13, 2017. The test results are based on the Peak Signal-to-Noise Ratio (PSNR) and Mean Square Error (MSE), where higher PSNR values indicate better quality of the processed image, and

- 8) **Motor Selection in The Game Using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) Method**, dalam The 13th International Conference on Green Technology (ICGT), “Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future”, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

the 13th International Conference on Green Technology
ICGT 2023 Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia

**MOTOR SELECTION IN THE GAME USING
TECHNIQUE FOR ORDER PREFERENCE BY
SIMILARITY TO IDEAL SOLUTION (TOPSIS)
METHOD**

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Abstract- In this paper, designing a recommendation system for the motor selection menu in the game "Blaz Rising". This recommendation feature in the game replaces the randomization function commonly used to suggest items for players. Unlike randomization, this feature considers the value of each criterion for motorcycle choices. The weights are determined using the Rank Order Centroid (ROC) method, which takes into account the

preferences of players. The vehicles can be cars, motorcycles, or others. There are various types of races such as circuit, street, drag, and off-road. Each type of race has different terrain and vehicles. Players can also customize their vehicles to suit the circuit, including choosing tires and adjusting suspension for maximum control and comfort [3].

- 9) **Improved Color Attenuation Prior for Kelud Crater Dehazing Process**, dalam The 13th International Conference on Green Technology (ICGT), “Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future”, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

IMPROVED COLOR ATTENUATION PRIOR FOR KELUD CRATER DEHAZING PROCESS

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Abstract- An image contains degradation due to haze, resulting in contrast reduction and color fading. In this research, a system has been implemented that is able to remove noise, haze effects or can be called dehazing on images of Mount Kelud. Because Mount Kelud is the most active mountain in Indonesia and the images on Mount Kelud are often covered with haze so that it hinders monitoring. In addition, the image contains a number of information that can be used in removing haze, therefore a method has been implemented for the removal of haze from the image, namely the Improved Color Attenuation Prior method, which is a method used in order to remove haze. Where the output results will also be calculated by various calculation methods to find the best value of the image. The results of the improved color attenuation prior method will also be compared with several methods that have been used in the context of haze removal, especially in the case of the crater of Mount Kelud, in terms of image quality and quantity calculation in the image will be

In the photography industry, image processing is a very important process. In the field of photography, it frequently happens to obtain results that were not intended, such as blurry images[6]. Hazy image is caused by a phenomenon in the sky known as noise. Haze is a group of extremely small air molecules that are laying down in the direction of the air.

There are a few methods that have been used to remove haze, the one of them is the dark channel(DC) method[7]. But this method has the drawback of over-saturation[8]. Another method that has been used is the Color Attenuation Prior (CAP)[9]. However, the drawbacks of this method are tends to only work on light fog and medium fog, and is not good at handling heavy haze[10].

10) **Non-Local Haze Removal For Mount Kelud Hazy Image**, dalam IOP Earth and Environmental Science (Scopus Indexed)-2023. Sebagai tindak lanjut The 13th International Conference on Green Technology (ICGT).

Non-Local Haze Removal For Mount Kelud Hazy Image

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Abstract. Mount Kelud is one of the active volcanoes located in East Java, Indonesia. Monitoring conducted through closed-circuit television (CCTV) is the activity to observe the volcano's activity. However, the images displayed by the CCTV are often inaccurate due to dense haze. There are several methods for haze removal to improve the degraded image quality caused by these issues, one of which is Non-Local Dehazing. The Non-Local Dehazing method has several advantages that can overcome the shortcomings of other haze removal methods, such as producing more consistent images under various lighting conditions. This study uses images of Mount Kelud taken over a period of 10 days from October 3, 2017, to October 13, 2017. The test results are based on the Peak Signal-to-Noise Ratio (PSNR) and Mean Square Error (MSE), where higher PSNR values indicate better quality of the processed image, and smaller MSE values indicate that the processed image approaches the original image. The non-local dehazing method has better PSNR and MSE values compared to the dark channel prior method but is still inferior to the color attenuation prior method. Therefore, the non-local dehazing method is effective and can be considered as one of the methods for reducing haze on Mount Kelud

1. Introduction

Mount Kelud is a volcano located in East Java, Indonesia. With an altitude of about 1,731 meters above sea level Mount Kelud is one of the most active volcanoes in Indonesia and has erupted several times

- 11) **3D Rooms Map Concept Based Augmented Reality For Green Library**, dalam IOP Earth and Environmental Science (Scopus Indexed)-2023. Sebagai tindak lanjut The 13th International Conference on Green Technology (ICGT).

3D Rooms Map Concept Based Augmented Reality For Green Library

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Abstract. Green library being an interesting topic for creating an environmentally friendly building. Libraries are synonymous with book lending services and comfortable reading rooms. The green library concept will be in line with increasing the comfort of library visitors. Libraries with large buildings certainly need a rooms map for information about their rooms for visitors. Technological advances have become an opportunity for libraries to develop location services library room based Augmented Reality (AR). Room maps generally use 2D images that provide information or instructions for all rooms in a building. The Augmented Reality approach as a rooms map based 3D will certainly provide a different experience to library visitors. Making AR rooms maps process will apply the Multimedia Development Life Cycle (MDLC) method. This method is suitable to be applied in multimedia product development. However, the resulting product is not only used as rooms map information, but can also be used as promotional tool for libraries

- 12) **Dynamic Difficulty Adjustment in EduGame Using Support Vector Machine Based on Sequential Minimum Optimization**, dalam Jurnal Nasional terakreditasi *Sinta 3*, *MATRIX - Jurnal Manajemen Teknologi dan Informatika*, p-ISSN: 2088-284X; e-ISSN: 2580-5630, Department of Electrical Engineering, Politeknik Negeri Bali.

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DOI: <http://dx.doi.org/10.31940/matrix.v1i3.1-10>
URL: <http://ojs2.pnb.ac.id/index.php/matrix>

Dynamic Difficulty Adjustment in EduGame Using Support Vector Machine based on Sequential Minimum Optimization

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- 13) **Dynamic Difficulty Adjustment Based On Support Vector Machine for EduGame**, dalam Jurnal Nasional terakreditasi *Sinta 3*, *IT Journal Research and Development*

IT Journal Research and Development (IJRD)
Vol.3, No.1, Maret 2018. E-ISSN : 2528-4053 | P-ISSN : 2528-4061
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Dynamic Difficulty Adjustment Based On Support Vector Machine for EduGame

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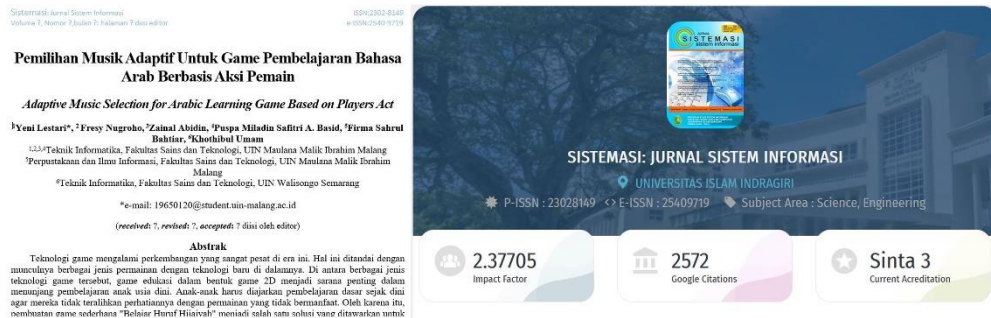
ABSTRACT (10 PT)

Volcanic eruption is a natural phenomenon that occurs due to the deposition of magma in the bowels of the earth and is emitted by gases that have high strength. Volcanic eruptions are one of the most



Development (ITJRD), p-ISSN:2528-4053 dan e-ISSN:2528-4061, Department of Electrical Engineering, Universitas Islam Riau.

- 14) **Pemilihan Musik Adaptif Untuk Game Pembelajaran Bahasa Arab Berbasis Aksi Pemain**, dalam Jurnal Nasional terakreditasi Sinta 3, Sistemasi: Jurnal Sistem Informasi, p-ISSN:2302-8149 dan e-ISSN: 2540-9719, Department of Electrical Engineering, Universitas Islam Indagiri, Tembilahan Riau Indonesia.

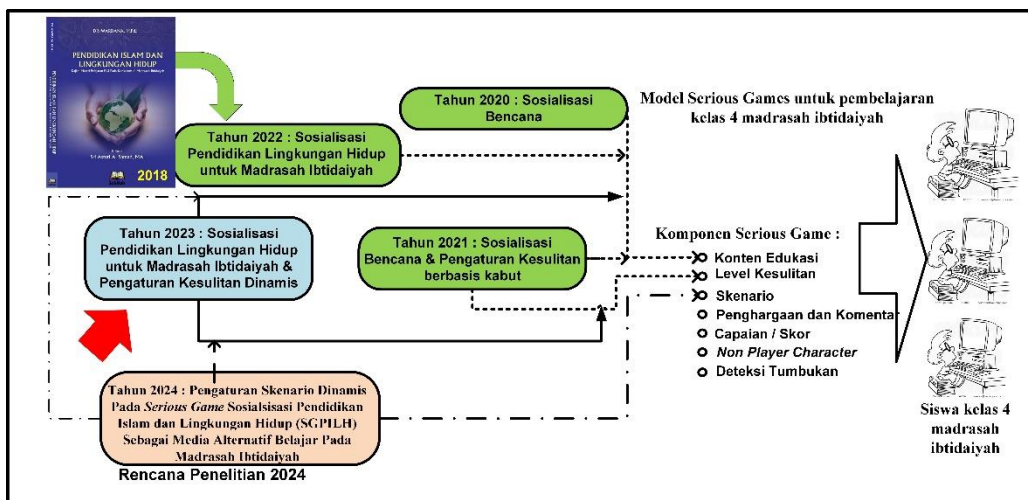


- 15) **Sertifikat HAKI : Game Green Environment.**



- 16) **Buku : Pengaturan Kesulitan Dinamis Pada Serious Game Pendidikan Islam dan Lingkungan Hidup untuk Madrasah Ibtidaiyah**, akan diterbitkan pada : UIN Maliki Press Malang.

4. Kajian Capaian Penelitian dan Luaran Penelitian



Gambar 1 Roadmap Investigasi

Penelitian ini telah di mulai sejak tiga tahun sebelumnya, yaitu berupa penelitian mandiri, pada tahun 2020, 2021 dan BOPTN UIN Maulana Malik Ibrahim Malang 2022 sebagaimana divisualisasikan dalam Gambar 1. Pada tahun 2020, peneliti mengajukan pengembangan *serious game* untuk sosialisasi bencana, sebagai alternatif belajar, berbasis model teori aktivitas dan taksonomi Bloom. Penelitian ini berfokus pada penerapan *serious game* dengan model aktivitas. Dimana aktivitas yg di gunakan sebagai rujukan adalah berupa aktivitas bermain, pembelajaran dan instruksi terhadap siswa/pemain. Dalam penelitian ini, peneliti menggabungkan konsep belajar siswa kelas 4 sekolah dasar, yang berbasis taksonomi Bloom, dan tahapan sosialisasi bencana yang di standarkan oleh pusat vulkanologi dan mitigasi bencana geologi Indonesia. Kemudian hasil penelitian di seminarkan pada Seminar Nasional dan Internasional, yaitu :

Selanjutnya, pada tahun 2021, peneliti mengajukan pengembangan *dynamic difficulty adjustment* untuk *serious game* sosialisasi bencana berbasis kerapatan kabut dan capaian pemain. Pada penelitian ini, kami mengajukan perubahan kesulitan dalam *serious game* yang mampu berubah ubah sesuai kemampuan pemain. Tingkat kesulitan yang di ubah berupa penambahan dan pengurangan kabut pada *serious game* 3D. Saat pemain mencapai skor yang tinggi, maka kabut akan makin tebal. Sebaliknya, bila pemain masih belum mampu mencapai skor tertentu, maka kabut akan menipis. Tujuan perubahan tebal tipis kabut adalah untuk mengurangi jarak pandang pemain saat bermain. *Serious game* yang di buat, memiliki bergenre *first person shooter*, 3 dimensi.

Pada tahun 2022, peneliti mengajukan “Desain *Serious game* untuk pendidikan islam dan lingkungan hidup (SGPILH) sebagai alternatif belajar pada kurikulum Madrasah Ibtidaiyah pasca pandemi”. Kurikulum ini sudah di terapkan pada salah satu madrasah ibtidaiyah, namun masih bersifat pengajaran klasikal di kelas. Peneliti berpendapat, bahwa, bila materi kombinasi mengenai lingkungan hidup dan agama islam diterapkan dalam *serious game*, akan sangat menarik dan mampu mengurangi kebosanan saat belajar. Fokus penelitian diterapkan pada siswa kelas 4 MI. Hasil penelitian awal, telah di terbitkan pada jurnal nasional SINTA 3, yaitu:

Selanjutnya untuk tahun 2023, peneliti mengajukan “Pengaturan Kesulitan Dinamis Berbasis Capaian Pemain Pada *Serious Game* Pendidikan Islam dan Lingkungan Hidup (SGPILH) Sebagai Media Alternatif Belajar Pada Madrasah Ibtidaiyah”. Penelitian ini merupakan penelitian lanjutan, dimana penelitian sebelumnya menemukan adanya kebosanan yang dialami siswa saat bermain. Penelitian ini berupaya mengurangi kekurangan tersebut, dengan mengatur tingkat kesulitan sesuai capaian pemain, mengingat setiap pemain memiliki karakter unik yang berbeda. Dengan fokus pengembangan pada siswa kelas 4 Madrasah Ibtidaiyah. Dengan judul dan abstrak sebagaimana diuraikan dalam subbab 5.

5. Uraian Judul dan Abstrak Capaian Luaran:

- 1) **Dynamic Difficulty Adjustment of Serious Game Based on Synthetic Fog Using Activity Theory Model**, pada jurnal *International Journal of Advanced Computer Science and Applications(IJACSA)* – Q3; SJR : 0,26; e-ISSN : 2156-5570; p-ISSN:2158-107X; Volume 14, No 6. 2023. DOI: 10.14569/IJACSA.2023.0140660.

Abstract— This study used the activity theory model to determine the dynamic difficulty adjustment of serious-game based on synthetic fog. The difference in difficulty levels was generated in a 3-dimensional game environment with changes determined by applying varying fog thickness. The activity theory model in serious-games aims to facilitate development analysis in terms of learning content, the equipment used, and the resulting in-game action. The difficulty levels varies according to the player's ability because the game is expected to reduce boredom and frustration. Furthermore, this study simulated scenarios of various conditions, scores, time remaining, and the lives of synthetic players. The experimental results showed that the system can change the game environment with different fog thicknesses according to synthetic player parameters.

Keywords— Dynamic difficulty adjustment; Serious-game; Activity theory model; Synthetic fog; Synthetic player

- 2) **Virtual Route Guide Chatbot Based on Random Forest Classifier**, pada jurnal *International Journal of Advanced Computer Science and Applications(IJACSA)* –

Abstract—Improvements in the quality of tourism services and the number of human resources will affect the quality of social services and information services provided to foreign tourists, thereby enhancing the quality of services offered regarding tourist destination information in the Malang Raya area. Considering the urgency of foreign tourists in obtaining information related to directions, routes, and access roads to their desired tourist destinations, especially in East Java, due to limited data from the government agencies handling the tourism sector, as well as the difficulty in communication with residents who may not understand what is being communicated by foreign tourists. Therefore, the need for an interactive chatbot to assist in obtaining routes and access information to the desired tourist destinations will facilitate foreign tourists. To improve the accuracy of the chatbot's ability to answer sentence selection, the use of artificial intelligence, specifically the Random Forest Classifier, is necessary. This study obtained the highest accuracy value using a tree quantity of 200, a maximum tree depth of 20, and a minimum sample split of 5. Using these quantities resulted in an accuracy of 95.88%, precision of 96.29%, recall of 96.03%, and f-measure of 96.16%.

Keywords—Tourism; chatbot; artificial intelligence; random forest classifier

- 3) **Engage Museum Experience Using Augmented Reality Based on Multimedia Development Life Cycle**, dalam The 4th International Conference On Engineering Technology and Technopreneurship (ICE2T 2023), “ Recovering Global Economy Through The Perspective of Engineering and Technopreneurship”, 15 & 16 August 2023, Perdana Kuala Lumpur City Centre, Kuala Lumpur, Malaysia.

Abstract— Multimedia Development Life Cycle (MDLC), to obtain an interesting experience about introducing objects in the Museum in Augmented Reality. This MDLC method comprises six stages: concept, engineering, material collection, assembly, testing, and distribution. Based on the trial, it is known that Augmented Reality could engage museum experience objects gets a positive response from users. Based on usability testing on respondents, 84.38% stated they were satisfied, and 83.24% of respondents stated that the resulting application was easy to use.

Keywords—MDLC, Engage, Museum, Experience, AR.

- 4) **Classification Based On Texture analysis for Synthetic Hazy Image from Mount Kelud Haze Image Density**, dalam *The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE)*, “From Technology 4.0 To Society 5.0”, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Abstract-This paper classifies the simulations of homogeneous synthetic images, heterogeneous synthetic hazy images, and original hazy images taken from CCTV (Close Circuit Television) of Mt. Kelud crater using the GLCM (Gray Level Co-Occurrence Matrix) method. The average feature values obtained using the GLCM (Gray Level Co-Occurrence Matrix) method are used to compare the similarity of gray feature values of the three and then classify thin, medium, and thick images. The results for classifying thin haze, medium

haze, and thick haze on the homogeneous synthetic hazy image test data obtained an accuracy value of 50%, a precision value of 46%, and a sensitivity value of 65%. As for the classification of thin, medium, and thick fog on heterogeneous synthetic hazy images, test data obtained an accuracy value of 42%, a precision value of 32%, and a sensitivity value of 48%.

Keyword: homogeneous synthetic hazy images; heterogeneous synthetic hazy images; original hazy images; classification; GLCM

- 5) **Improved Color Attenuation Prior for Kelud Crater Image Dehazing**, dalam *The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), "From Technology 4.0 To Society 5.0"*, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Abstract— Images that contain disturbances, such as haze, are very disturbing in the visibility of the image because they experience a reduction in contrast and color. In this study, we implement a system that can remove the effects of fog or noise. Therefore, the method used is expected to remove noise efficiently. The Improved Color Attenuation Prior method uses the Color Attenuation Prior principle. The output obtained is a better visibility quality image.

Keywords—Dehazing, Improved Color Attenuation Prior, Noise, Kelud Mountain, Image Processing

- 6) **Recommender Selection System for The Game Using Bonferroni Mean Based TOPSIS**, dalam *The 8th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), "From Technology 4.0 To Society 5.0"*, 28th September 2023, Malang, Indonesia, organized by Universitas Negeri Malang.

Abstract—In this paper, a recommendation system is applied to the motor selection menu in the game "Blar Rising". This recommendation feature is provided in the selection menu to replace the commonly used randomize feature in many games. The recommendation feature takes into account each criterion of the available motors. The determination of weights is done using the ROC method, which considers the level of importance of the criteria. Therefore, in the game, there is a selection of tracks or terrains used to differentiate the importance level for weight determination. In its implementation, Bonferroni mean (BM) is used to generalize the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method. This can be observed from the difference in the results for each alternative. The TOPSIS-BM method yields similar results for each alternative, while the original TOPSIS method shows significant differences.

Keywords—TOPSIS, Similarity, Bonferroni mean

- 7) **Non-Local Haze Removal For Mount Kelud Hazy Image**, dalam *The 13th International Conference on Green Technology (ICGT), "Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future"*, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

Abstract. Mount Kelud is one of the active volcanoes located in East Java, Indonesia. Monitoring conducted through closed-circuit television (CCTV) is the activity to observe

the volcano's activity. However, the images displayed by the CCTV are often inaccurate due to dense haze. There are several methods for haze removal to improve the degraded image quality caused by these issues, one of which is Non-Local Dehazing. The Non-Local Dehazing method has several advantages that can overcome the shortcomings of other haze removal methods, such as producing more consistent images under various lighting conditions. This study uses images of Mount Kelud taken over a period of 10 days from October 3, 2017, to October 13, 2017. The test results are based on the Peak Signal-to-Noise Ratio (PSNR) and Mean Square Error (MSE), where higher PSNR values indicate better quality of the processed image, and smaller MSE values indicate that the processed image approaches the original image. The non-local dehazing method has better PSNR and MSE values compared to the dark channel prior method but is still inferior to the color attenuation prior method. Therefore, the non-local dehazing method is effective and can be considered as one of the methods for reducing haze on Mount Kelud.

- 8) **Motor Selection in The Game Using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) Method**, dalam The 13th International Conference on Green Technology (ICGT), “Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future”, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

Abstract. In this paper, designing a recommendation system for the motor selection menu in the game "Blar Rising". This recommendation feature in the game replaces the randomize function commonly used to suggest items for players. Unlike randomization, this feature considers the value of each criterion for motorcycle choices. The weights are determined using the Rank Order Centroid (ROC) method, which takes into account the criteria's importance. The game uses track or terrain selection to differentiate importance levels. The motorcycle recommendation process employs the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method. The TOPSIS method is employed to solve this problem, where TOPSIS will rank the final results and provide recommendations for the alternative motorcycle choices given which calculate the positive ideal distance and negative ideal distance. Furthermore, usability testing was conducted based on 5 aspects, resulting in an overall average score of 3.43, with details of learnability at 2.95, efficiency at 3.87, memorability at 3.67, error at 3.20, and satisfaction at 3.45. This indicates a fairly good user acceptance of the recommendation feature by players.

Keywords : Game, ROC, TOPSIS, Recommendation system;

- 9) **Improved Color Attenuation Prior for Kelud Crater Dehazing Process**, dalam The 13th International Conference on Green Technology (ICGT), “Strengthening the Impact of STEM world (Science, Technology, Engineering, and Mathematics) for a Sustainable Future”, 17-18th October 2023, Malang, Indonesia, organized by Universitas Islam Negeri Maulana Malik Ibrahim Malang.

Abstract- An image contains degradation due to haze, resulting in contrast reduction and color fading. In this research, a system has been implemented that is able to remove noise, haze effects or can be called dehazing on images of Mount Kelud. Because Mount Kelud is

the most active mountain in Indonesia and the images on Mount Kelud are often covered with haze so that it hinders monitoring. In addition, the image contains a number of information that can be used in removing haze, therefore a method has been implemented for the removal of haze from the image, namely the Improved Color Attenuation Prior method, which is a method used in order to remove haze. Where the output results will also be calculated by various calculation methods to find the best value of the image. The results of the improved color attenuation prior method will also be compared with several methods that have been used in the context of haze removal, especially in the case of the crater of Mount Kelud. in terms of image quality and quantity calculation in the image will be compared which one is the most effective. The visual output obtained is an image that has been separated from the haze effect with better quality.

Keywords—Dehazing; Image Processing; Improved Color Attenuation Prior; Kelud Mountain; Noise

10) **Non-Local Haze Removal For Mount Kelud Hazy Image**, dalam IOP Earth and Environmental Science (Scopus Indexed)-2023.

Abstract. Mount Kelud is one of the active volcanoes located in East Java, Indonesia. Monitoring conducted through closed-circuit television (CCTV) is the activity to observe the volcano's activity. However, the images displayed by the CCTV are often inaccurate due to dense haze. There are several methods for haze removal to improve the degraded image quality caused by these issues, one of which is Non-Local Dehazing. The Non-Local Dehazing method has several advantages that can overcome the shortcomings of other haze removal methods, such as producing more consistent images under various lighting conditions. This study uses images of Mount Kelud taken over a period of 10 days from October 3, 2017, to October 13, 2017. The test results are based on the Peak Signal-to-Noise Ratio (PSNR) and Mean Square Error (MSE), where higher PSNR values indicate better quality of the processed image, and smaller MSE values indicate that the processed image approaches the original image. The non-local dehazing method has better PSNR and MSE values compared to the dark channel prior method but is still inferior to the color attenuation prior method. Therefore, the non-local dehazing method is effective and can be considered as one of the methods for reducing haze on Mount Kelud

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multimedia product development. However, the resulting product is not only used as rooms map information, but can also be used as promotional tool for libraries

- 12) **Dynamic Difficulty Adjustment in EduGame Using Support Vector Machine Based on Sequential Minimum Optimization**, dalam Jurnal Nasional terakreditasi *Sinta 3*, MATRIX - Jurnal Manajemen Teknologi dan Informatika, p-ISSN: 2088-284X; e-ISSN: 2580-5630, Department of Electrical Engineering, Politeknik Negeri Bali.

Abstract: A volcano is a crater or fissure in the earth's crust through which magma or gas or other liquid discharges to the earth's surface. The volcanic eruptions are one of the most devastating disasters. In Indonesia, the volcanic eruptions are one of the fearest disasters therefore to train the management of volcanic disaster, the community is given education in the form of. The advantages of the game is as a socialization place providing practical experience in order to comprehend the materials easily. This game applies the Support Vector Machine method with the Sequential Minimum Optimization (SMO) training model. It is because this model is capable of predicting and generating levels with a high accuracy. This model is applied as an adjustment of the difficulty level described by the fog intensity which gets thicker and the questions are automatically adjusted according to the player's abilities. There are seven variables of input data consisting of score, player health, time, number of items, type of items, number of enemies and type of enemies. After obtaining the value of each variable, the data is processed with the Support Vector Machine method which is assisted by the Sequential Minimum Optimization algorithm to obtain the dynamic difficulty level in the game.

Keywords: Dynamic Difficulty Adjustment, Educational Game, Support Vector Machine, Sequential Minimum Optimization

- 13) **Dynamic Difficulty Adjustment Based On Support Vector Machine for EduGame**, dalam Jurnal Nasional terakreditasi *Sinta 3*, IT Journal Research and Development (ITJRD), p-ISSN:2528-4053 dan e-ISSN:2528-4061, Department of Electrical Engineering, Universitas Islam Riau.

Abstract. Volcanic eruption is a natural phenomenon that occurs due to the deposition of magma in the bowels of the earth and is emitted by gases that have high strength. Volcanic eruptions are one of the most devastating natural disasters. In Indonesia, volcanic eruption is one of the most fearest disasters by many people, therefore to train disaster management of volcanic eruptions, the community is given education in the form of an adventure-themed game that describes the preparations when the volcanic eruption occurs. The advantages of games as a means of socialization for the community that can provide practical experience so that participants can understand the material easily. This game uses the Support Vector Machine method to automatically adjust the difficulty level according to the player's ability. There are 7 variables including score as input data in this game, consisting of player blood, time, number of items, type of item, number of enemies and type of enemy. Tests are conducted utilizing System Usability Scale (SUS) testing with a SUS score of 62.5%.

Keyword: Dynamic Difficulty Adjustment; Volcano Eruption; Support Vector Machine; Educational Game

- 14) **Pemilihan Musik Adaptif Untuk Game Pembelajaran Bahasa Arab Berbasis Aksi Pemain**, dalam Jurnal Nasional terakreditasi Sinta 3, Sistemasi: Jurnal Sistem Informasi, p-ISSN:2302-8149 dan e-ISSN: 2540–9719, Department of Electrical Engineering, Universitas Islam Indagiri, Tembilahan Riau Indonesia.

Abstrak

Teknologi game mengalami perkembangan yang sangat pesat di era ini. Hal ini ditandai dengan munculnya berbagai jenis permainan dengan teknologi baru di dalamnya. Di antara berbagai jenis teknologi game tersebut, game edukasi dalam bentuk game 2D menjadi sarana penting dalam menunjang pembelajaran anak usia dini. Anak-anak harus diajarkan pembelajaran dasar sejak dini agar mereka tidak teralihkan perhatiannya dengan permainan yang tidak bermanfaat. Oleh karena itu, pembuatan game sederhana "Belajar Huruf Hijaiyah" menjadi salah satu solusi yang ditawarkan untuk mendukung proses pembelajaran huruf-huruf Al Qur'an pada anak sejak usia dini. Tentu saja membuat game saja tidak cukup, sehingga penelitian ini berfokus pada peningkatan pengalaman pengguna dengan menambahkan musik adaptif ke dalam game. Untuk menentukan musik adaptif pada game, digunakan beberapa atribut, seperti jarak antara pemain dengan NPC musuh, kecepatan pemain, dan jarak antara pemain dengan gawang. Untuk menentukan musik adaptif pada penelitian ini, digunakan metode decision tree dengan algoritma C4.5. Metode ini menggunakan parameter perhitungan nilai entropy dan nilai gain untuk setiap atribut yang digunakan, yaitu jarak pemain dengan NPC musuh, kecepatan pemain, dan jarak pemain dengan goal, untuk membentuk pohon keputusan. Setelah pohon keputusan terbentuk, aturan yang dihasilkan diimplementasikan ke dalam game untuk menentukan musik adaptif yang digunakan dalam game. Hasil dari penelitian ini adalah terciptanya sebuah game 2D "Learn Hijaiyah" yang menggunakan musik adaptif untuk meningkatkan pengalaman pengguna saat bermain game berbahasa Arab.

Kata kunci: Musik Adaptif, Pembelajaran Bahasa Arab, Game, Decision Tree, algoritma C4.5, pemain, tindakan, sistem.

- 15) Hak Kekayaan Intelektual → “**Game Green Environment**”, No. 000532197, Tanggal : 25 Oktober 2023.

Ringkasan Judul *Game*

Game Green Environment – adalah *game* dengan genre *Third Person Shooter* dengan sub genre dari *game action*. *Game* ini memiliki mode bermain yaitu *multiplayer* yang di hubungkan melalui jaringan memakai Forge yang dikembangkan oleh Bearded Man Studios Inc yang dimana plugins ini diperoleh dari github. Karakter didalam *game* ini yaitu pemain berperan sebagai siswa madrasah.

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