

歴史都市防災論文集 Vol.10 掲載論文・報告一覧

【論文】

1. 高山伝統構法木造建築物の3次元地震応答解析による積雪荷重の影響

3D Earthquake Response Analysis for Un-anchored Traditional Wooden Houses in Takayama Style Considering the Snow Load

村田晶・清水一史・吉富信太・向坊恭介

In Japan, some traditional wooden houses are not fixed with base stones (ishibadate base) on the ground. When an earthquake occurred, they were sliding on stones. In order to clarify influence of an earthquake, many static load tests and shaking table tests have been executed. These reports show the data on this sliding phenomena of un-anchored structures. The data on this sliding phenomena is needed for structural design. Moreover many un-anchored traditional wooden houses exist in a snow coverage area. So we have to consider the effect of snow load.

In this study, we have purposes to estimate the mechanism of ishibadate base in Takayama style. First, to verify the earthquake response performance of the ishibadate base. Second, to verify the effects of the snow load for un-anchored traditional wooden houses.

2. 高山市伝統木造軸組構法建物における柱脚特性を考慮した全体架構モデルの応答解析

A Study on Structural Response Analysis of Miyajike-juutaku Based on 3D Frame Model Considering Traditional Base Structure

吉富信太・河村拓実・村田晶・向坊恭介

There still remain many old traditional wooden structures after sever earthquakes in Japan in spite of their low seismic performance. It has been pointed out that the slide and rift phenomena which happen at the base of traditional wooden structure decrease a damage of the upper structure. In this paper, the effect of the characteristics of traditional wooden structure base is examined through timehistory analysis of 3D detailed analysis models which are given different coefficient of friction at the base. It is demonstrated that slide and rift deformation have inverse proportional relationship.

3. 伝統的構法通し貫仕口のめり込みの繰り返し復元力特性

Restoring Force Characteristics of Embedment of Traditional Wooden Joints due to Cyclic Loadings

棚橋秀光・大岡優・白井悠吾・岩本いづみ・鈴木祥之

The authors have researched the mechanisms and formulations of traditional wooden joints with wedges applying the Elasto-plastic Pasternak model. However, restoring force characteristics of embedment of traditional wooden joints due to cyclic loadings have not been clarified so far, although cyclic loadings have significant effects on their behaviors.

Thus, the authors carried out the basic embedment tests of traditional wooden joints with/without wedges due to cyclic loadings and their restoring force characteristics were obtained and discussed. As a result, cyclic loadings have large effects on the stiffness and strength of the restoring force characteristics of joints.

4. かしも明治座における板壁の水平抵抗メカニズムに関する研究

A Study for Lateral Resistance Characteristics of Board Wall of Traditional Wooden Structure

須田達・鈴木祥之

The wooden board walls are used in many of the traditional wooden buildings. These board walls are expected as a structural element to resist the horizontal force. However, board wall is because it is made by a variety of specifications in each region, the elucidation of resistance mechanism is not sufficient. In this study, to elucidate the structure performance to conducted the static loading tests of the board wall. In addition, wood embedment resistance is evaluated by the elements experiment, it is presumed the configuration of the resistance elements of the board wall.

5. 階段を利用した伝統木造二重門の制震補強

Retrofitting Method Using Viscoelastic Dampers for Traditional Timber Temple Gate

向坊恭介・鈴木祥之

In this paper, a retrofitting method using viscoelastic dampers for the two-storied traditional timber temple gate is proposed. The dampers are installed beneath the external stairs which are attached to the temple gate. We conducted shaking table tests by use of a timber frame with dampers to examine the effectiveness of the retrofitting method. It is found that the proposed method satisfactorily reduced the seismic response of the timber frame in the direction parallel to the stairs. Seismic response analysis of two-degree-of-freedom system was also executed to verify the effectiveness of the proposed method for the temple gate.

6. 重要文化財周辺斜面における斜面災害復旧対策

Slope disaster recovery measures around important cultural properties

宇次原雅之・深川良一・山田守・堀江直樹・梶間義弘・長谷部聖志

Recently in Japan, slope disaster often occurs due to heavy rainfall. As a result, the damage of important cultural properties including temples, castles and others are increasing, because these are often located on the slope of mountains. Slopes surrounding important cultural properties constitute “historical landscape” which has been conveyed for long term with cultural assets buildings. Therefore, when slopes that collapsed in the vicinity of important cultural properties are recovered, it is very important to be take care of about not only “slope stability” but also “preservation of historical landscape”. In this paper, the examples that recovered slopes in the Kiyomizu-dera Temple which had collapsed due to heavy rainfall are reported. Then ways of thinking of the choice of the slope disaster recovery measures around important cultural properties are discussed.

7. 清水寺観測斜面における地上雨量とレーダ雨量との差異に関する一考察

Differences in the rainfall characteristics between observed and radar rainfall at Kiyomizu-dera Temple

檀上徹・藤本将光・石澤友浩・有光悠紀・深川良一

The risk of sediment disasters was examined from rainfall data obtained from rader (XRAIN with 1-km mesh size). Since the scale of slope failure is smaller than that of XRAIN with the 1-km mesh, it is necessary to evaluate the accuracy of the XRAIN output values for the target slope. We compared the observational rainfall data obtained at the site, XRAIN (1-km mesh), XRAIN (250-m mesh), and rainfall data from the Japan Meteorological Agency to evaluate the timing of the advisory or warning of sediment disaster. Our results showed a close correlation between the observed rainfall and XRAIN (250-m mesh), and indicated that the XRAIN (250-m mesh) data are suitable for assessing the risk of sediment disasters.

8. 京都市東山地域における斜面崩壊の潜在的危険度評価

Evaluation of the potential risk of a sediment disaster at Kiyomizu-dera Temple area

藤本将光・戸田堅一郎・有光悠紀・里深好文・深川良一

To evaluate the potential risk of sediment disasters at Kiyomizu-dera Temple, we investigated the spatial distribution of springs based on a topographical analysis using a Curvature and Slope (CS) topographical map. The study area was divided into two areas, erosion and non-erosion, divided by a fault line. We observed springs with small slope collapse at numerous points in the erosion area. Our results suggest deep infiltration of groundwater in the non-erosion area, and exfiltration of groundwater in the erosion area, leading to the occurrence of slope collapse.

9. 清水寺周辺溪流における土石流氾濫解析

Numerical analysis of debris flow at Kiyomizu dera temple area

縄手洋介・梶山敦司・藤本将光・里深好文

In recent years, there have been numerous episodes of torrential rains, which have led to a high risk of flood disasters in various parts of Japan, including sites of important cultural assets. Our research site, the area around Kiyomizu-dera Temple, has been damaged by

floods and mass movements several times during the past two decades. To evaluate the risk of flood disaster in the area, we performed a two-dimensional numerical simulation of the debris flow using Hyper KANAKO software based on a 1-m mesh size Digital Elevation Model (DEM), and compared the output to previous results obtained from a 10-m mesh size DEM. Our results show a detailed sediment disaster risk, including the flood pathway for a heavy rainfall event in the downstream residential area around Kiyomizu-dera Temple.

10. 近年の新聞報道からみた社寺における盗難と火災

The Recent Trends and Characteristics of Theft and Fire Incidences at Temples and Shrines based on Newspaper Articles

谷崎友紀・中谷友樹

The aim of this article is to examine the recent trends and characteristics of human-made disasters on cultural heritages by focusing on theft of cultural properties and fires of historical buildings at temples and shrines in Japan. Since there is no periodic surveys on the human-made disasters at temples and shrines, we used the online database of articles of Yomiuri-Shinbun, one of the most major newspaper in the country, to extract incidences of theft and fire at temples and shrines from 1986 to 2014. We integrated duplication of articles on the same incidence and then tabulated the incidence to identify the temporal and geographical trends of the extracted incidences with distinct characteristics of those identified from the article descriptions. For both theft and fire, the number of incidences appeared in the newspaper has drastically increased around 2000 in most of regions. The newspaper articles highlighted the raised risks of human-made disasters on cultural heritage in recent times, including international trades of stolen properties and serial crimes targeting local temples and shrines without resident priest.

11. 五箇山相倉集落合掌造民家の消火・防火性能の現状調査

A survey on the present condition of fire fighting and fire prevention performance in "Gassho-dukuri" house of Ainokura village, Gokayama district

平尾和洋・梶山雄大・川村真弘

Ainokura village is located on Gokayama area in Toyama prefecture, and a lot of traditional thatched farm houses are built. Recently, Ainokura village was registered with the world's heritage in 2012, and the guideline of village preservation is indicated by a master plan, but the detail of taking measure to fire prevention isn't exist. Then the purpose of this study is to disclose the efficacy of the fire fighting by using the fire extinguishing systems in the village, and the weakness of farm house in fire emergency by hearing and field work.

12. 朽木谷における茅葺民家の残存および防火意匠の現状調査

A survey on the present condition of fire prevention design and the proposals of rural house in Kutsuki valley

遠藤直久・酒井理恵・平尾和洋

In this paper, it is showed the fire prevention performance derived from "Kutsuki-model", the result of survey in Kutsuki valley located on the west coast of Lake Biwa, and The model is compared to "Yogomodel". As a result, fire prevention performance of Kutsuki is generally higher than that of Yogo district. In addition, I clarified a fragility against fire prevention performance, especially on the vent hole of gable wall, the ventilation ridge, the aperture behind the eaves, and the walls on "Omote and Ura". Based on the above, the guideline every each part of "Kutsuki-model" for fire prevention is proposed.

13. 効率的なノズル開発に向けた散水挙動の理論的考察

～延焼火災から歴史的な木造密集市街地を守る街路壁面散水設備 (WSS) の開発～

Theoretical considerations of water sprinkling morphology for efficiently preparing the nozzle of WSS which sprinkles limited water to facade of wooden narrow street for controlling radiant heat and protecting historic districts

栗原拓大・大窪健之・金度源・林倫子

A piece of Japanese traditional cityscape, there is wooden cultural city. However in high

densely areas of wooden cultural city, it is difficult to control spread as large-scale fire after earthquake etc. Water Shield System is a kind of firefighting equipment that sprays water to the surface of wooden walls facing toward spread, reduce the temperature from radiant heat and decrease the speed of fire spreading across narrow streets in traditional high density areas. This study aims to reveal the actions of water droplet which be drained off from a uniforate water spray nozzle based on an actual water spray nozzle which can sprinkle for a wide range of area for more efficiently preparing the WSS nozzle.

14. 京都における民衆の防火意識の変遷 —明治期から昭和期に着目して—

The changes of fire prevention consciousness of Kyoto residents -Based on the history of fire and fire-fighting-

岡谷藍

This paper focus on the history of fire and firefighting system during Meiji period. This research shows how firefighting system of Kyoto modernized and how the consciousness of people changed along with the modernized of firefighting system through the view from an article of the *Kyoto-Hinode Times* articles, which was major newspaper from Meiji-period until Taisho-period. In addition, it points out that fire prevention consciousness came from fire-related concern culture and customs. However, because of the development of the firefighting system, the consciousness of people toward fire prevention became lower than before.

15. 江戸の都市構造と防火施策の背景

Background of the urban structure and fire protection measures in Edo

森下雄治

Since urban construction in Edo progressed within the constraints on the terrain and the structural principle was based on military strategic arrangements, there was significantly uneven distribution of highly dense townsmen's districts. In the event of a fire, this contradictory urban structure, along with the unique terrain and the force of wind, amplified the spread of fire. After the Great Fire of Meireki, measures were implemented to correct the faults in urban structure, such as creating designated open areas as a firebreak, although the effects were limited. In the Kyoho era, as a complementary solution to these firebreaks, fire protection architecture measures were introduced. Background of its introduction was the unique architectural history in Edo.

16. 橋梁における歴史的な流木対策に関する研究

Traditional technique in Japan using stakes to prevent bridge blockages caused by driftwood

原田紹臣・里深好文

In Japan, stakes that collect driftwood have long been used to prevent the blockage of bridges. However, design codes are not established; thus, stake installations differ for individual bridges. It is important to clarify the function of these stakes; for example, stakes can be used to prevent rubbish from accumulating near a pier. In this paper, we demonstrate a fundamental experiment that explored the function of traditional stakes as a countermeasure against driftwood accumulation. It was found that driftwood passes between piers after rotation about the stake. Consequently, it is suggested that stakes should be installed vertically at bridges to divert drift wood and protect the bridge.

17. 京都市中心部における細街路に接する敷地後退部分の利用実態

A study on the utilization of setback spaces in narrow streets in Kyoto

折本大輝・岡井有佳・小池貴大・吉田隼斗

The provision of the Building Standards Law Article 42 paragraph (2) obligates setbacks for construction in narrow streets with widths of less than 4m. However, setbacks are not enforced by the Law. The central part of Kyoto City has numerous narrow streets, which carry risks in terms of disaster prevention. Kyoto City has taken measures to improve these narrow streets and promote their appropriate use. This study clarifies the actual situation of

the use of setback spaces in narrow streets. It is argued that there are the problems of disaster prevention on the use of setback spaces, however marking the limit of setbacks will help to resolve the problem.

18. 歴史的な町並み保存のための建築規制緩和に対する災害対策の研究
 ～神戸市北野町山本通重要伝統的建造物群保存地区を対象として～

A Study for Disaster Mitigation Measure to Relax Restriction on Building Control: Kitano-cho Yamamoto-dori The Important Preservation District for Groups of Historical Buildings

金度源・大窪健之・林倫子・塩田一貴

Kitano-cho Yamamoto-dori is one of the Important Preservation District for Groups of Historic Buildings in Japan. Unfortunately, this cultural historical district is inappropriate on the control for the Area of Lighting, the Building-Line, the Building-Coverage and the Setback-Line, which are based on current building control for the safety. This study suggests the counter measure against to the fire disaster and the earthquake disaster to relax these ordinances.

19. 防災活動への合意形成を目指した住民ワークショップ手法に関する研究
 ～京都府与謝野町加悦重伝建地区を対象として～

A Study of the Citizens' Workshop Planned to Consensus Building for Mitigation Activities Case Study in the Kaya Important Preservation Districts for Groups of Traditional Buildings

宮田雄大・大窪健之・金度源・林倫子

Because the traditional buildings preservation district which most are constructed in a wooden building beyond the normal service life has difficulty in measures by the hard maintenance business to modify cityscape, the measures with the software aspect are necessary. In addition, because it is necessary to devise a disaster prevention plan from the viewpoint of inhabitants coping at the time of a disaster, the disaster prevention plan reflects inhabitant opinion by the inhabitant workshop which is an example of soft aspect measures. However, the opinion given there is not necessarily reflected to disaster prevention plan development, and it is the present conditions that the method to decide the disaster prevention activity of the district is not established by inhabitant workshop. This study suggested a method aiming at the agreement formation to disaster prevention activity in a traditional buildings preservation district from the opinion that obtained by inhabitant workshop through analysis, inhabitant questionnaire survey. From the result, this study discussed the need of this technique as a method of the future district disaster prevention plan promotion.

20. プロブデータをを用いた豪雨災害時の道路交通状況の分析

Analysis of road traffic situation at heavy rain disaster based on probe data

早川聡一郎・塩見康博

Large-scale disaster cause not only threaten the lives of people directly, giving effect of great economic losses to social infrastructure. We should consider about measures for the transport plane at the time of heavy rain disaster. The purpose of this study is analyzing road traffic conditions at the time of a disaster by using a probe data. Analyzing movements of car, further, identify the big change location compared to normal time, and consider the characteristics of the place. As a result, in many cases, drivers who received the closure choiced the detour and move in time to typhoons closing, and the road that decrease the moving speed was what is the main road linking the city and the city, also called the detour.

21. 阪神・淡路大震災における社寺の延焼抑止要因と避難地利用に関する調査研究
 ～兵庫県神戸市の社寺を対象として～

A Survey Research about Using Shrines and Temples as Evacuation Shelter and their Fire Spreading Prevention at the Great Hanshin-Awaji Earthquake

国島岳大・大窪健之・金度源・林倫子

In the Great Hanshin-Awaji Earthquake, especially Kobe-city had a great damage by a quake and fire. A lot of people evacuated in designated evacuation shelters, so many people have to

evacuate places which was not designated as a evacuation shelters. But not designated evacuation shelters, for example shrines and temples, many people lived there. And, shrines and temples in Kobe-city made a role which prevents to spread fire in Great Hanshin-Awaji Earthquake. This survey research shows how to use the spaces as evacuation shelters in shrines and temples, and the factor of fire spreading prevention.

22. 歴史都市における指定避難所を経由した広域避難場所への効果的な避難経路に関する研究
A Study on the Evacuation Routes for Tourists to Evacuation Sites via Temporary Gathering Locations in Historical Cities

小川圭一・藤井勇希・塚口博司・安隆浩

In this paper, evacuation routes for tourists from cultural heritage as sightseeing spots to evacuation sites via temporary gathering locations are considered in Kamigyō Ward and Higashiyama Ward in Kyoto City, which is a typical historical city in Japan. Evacuation routes from cultural heritage to evacuation sites via temporary gathering locations are identified from the viewpoints of distances, reachability rates in disaster situation and numbers of intersections. A comprehensive indicator which integrates these three viewpoints is proposed to evaluate the evacuation routes from cultural heritage to evacuation sites via temporary gathering locations.

23. ピクトグラムの認識に関する調査とベイズの定理を用いた正しい避難に有用なワードの分析
Questionnaire of pictogram recognition and Analysis of helpful words for the correct evacuation choice using Bayes' theorem

石田優子・崔明姫・酒井宏平・豊田祐輔・鐘ヶ江秀彦・深川良一

It is important to provide the disaster prevention information easy to understanding for international tourists at the cultural heritage sites. This paper reports the analysis results of the questionnaire survey from tourists which was conducted in 2014. The results of pictogram recognition survey indicate possibilities that people doesn't use color for recognition of sign meaning, and extra shape leads to misunderstanding. And the result of survey about selecting evacuation route extracted 3 words, "quickly", "safely", "easily", which people give attention. In addition, helpful influential words for correct evacuate did not obtained by Bayes analysis.

【報告】**1. Out-of-plane Analysis of In-filled Brick Masonry Wall**

Zilong Qian, Toshikazu Ikemoto, Reza Amiraslazadeh and Masakatsu Miyajima

In current day, 60% of world's population is living in masonry house¹⁾. In addition, the distribution of masonry house is coincident with earthquake occurring areas. Therefore, masonry houses are vulnerable to earthquake and make loss of casualties and property. In this study, the objective is to determine the behavior of out-of-plane failure in brick masonry wall through the static analysis by using FEM, and improve the seismic stability during earthquake due to the protection of masonry structure.

**2. 災害情報を即時共有する地域防災情報システムの機能拡張と地域特性に着目した配信方法の検討
～与謝野町加悦重伝建地区を対象として～***Research on Expansion of Function and Study on Information Delivery Policy for Developing the Local Disaster Information System in Kaya Preservation District*

大窪健之・岩井渉・金度源・林倫子

Once a fire occurs at a traditional wooden house like in the Preservation District for Groups of Historic Buildings, there is a serious risk of the various disaster. Because of collapse in traditional community system, there is a possibility that the traditional streetscape and the human life will be lost in sudden disasters. The aim of this research is to develop a new disaster information network by combining existing facilities in there, to share the information of fire, sediment and flood disaster in the area, for improving quick initial acution.

3. 近世・大坂の発展と宝永地震（1707年）による被害*The Development of Osaka in Early Modern Age and Damage from The Hoei Earthquake (1707)*

長尾武

In 1583 Toyotomi Hideyoshi started to construct Osaka Castle and City. After the Toyotomi family was overthrown by Tokugawa shogunate, Osaka City began expanding towards the Yodo River delta. The ground was low and soft. People developed lowlands for housing sites, excavated canals and utilized the soil to rise ground level higher than 3.0 m in height. In 1707, the Hoei earthquake (M8.6) hit Osaka. Many houses collapsed in lowlands areas. About two hours after shaking, a big tsunami rushed into Osaka. The tsunami severely damaged Osaka City, but it was not so high that it washed away houses. The construction measures implemented against flooding damage in Osaka City were effective. However, outside of the city along Osaka Bay, the tsunami broke banks and washed away rice fields, houses and many people drowned.

4. 2015年ゴルカ地震における伝統的中庭空間の避難時の利用実態**—世界遺産カトマンズ・パタン地区を対象に—***A Research of the Evacuate Condition and Using of Traditional Courtyards at the Time of Gorkha Earthquake in Patan, Kathmandu Valley, World Heritage Site*

高杉三四郎・大窪健之・サキヤラタ・金度源・林倫子

This survey clarifies that the actual situation in traditional courtyards at the time of the evacuation for Gorkha Earthquake in Patan, World Heritage Site, Kathmandu. For understanding how the local community used their courtyards at the time of main shock and after shock, the change in utilization of spaces and traditional elements, the activities by local residents, and the problems of the evacuate life in the courtyards were reviled by the research with individual interviews and group interview.

5. トルコ国における文化遺産保護・防災の取り組みについて*Disaster Risk Reduction for Tangible Cultural Heritage in Turkey*

長谷川庄司

Turkey is one of the most disaster prone counties in the world due to its tectonic, seismic, topographic and climate structure. Earthquake takes the first place when evaluated in terms of damaging extent even though other disasters such as floods, landslides, rockfalls, avalanches are common in Turkey On the other hand, there are a lot of the world heritage

sites throughout the country. In order to cope with this situation, the Government of Turkey has been faced the need of preparing plan and countermeasures against disasters.

The Ministry of Culture and Tourism in cooperation with Japan International Cooperation Agency, Turkey Office and JICA Alumini of Turkey held the seminar on “Protection of Cutral Heritage and Disasters” to share the knowledge of countermeasures agains disaasters used in Tuekry and Japan.

6. Study on the fire prevention countermeasures about historic town in Southwest China —Taking Xiping ancient town in Sichuan province as the example—

黃凌誌・張榮霞・劉弘濤

Most traditional architecture in southwest China is the whole wood material, so that it easy to be fired and cause widespread fires. This article is based on the present situation and the protection of Xiping ancient town in Santai county, Sichuan province of China architectural form, architectural layers, architectural style, architectural structure present situation will be explained, which discussed the reasons for the fire risk in Xiping town, and from building construction, construction safety lighting, architectural surrounding environment and other aspects of proposed fire preventive measures aimed at forming regional characteristics of traditional building fire mode.

7. Research on the Flood Control Problems of Cultural Heritage in Southwest of China —A Case Study on the World Heritage Site Dujiangyan—

王璇・高勛達・劉弘濤・江俊濤

In recent years, frequent flood disasters happened in southwest of China have a great threat to the cultural heritages. This paper takes the world heritage site Dujiangyan as the example, analyzes reasons of floods destroying cultural heritages in southwest of China and discusses the related issues of flood control. Results show that natural environmental changes, impact of modern construction and lacking public participation are main reasons of cultural heritages destroyed severely by floods. And then lack of traditional flood control methods and unsound modern flood risk management system are also reasons for the flood disaster.