京都大学	博士（ 工 学）	氏名	NGUYEN TAN
論文題目	Load transfer mechanisms and seismic stability of embankments subjected to basal subsidence （基礎地盤沈下を受けた盛土の荷重伝達メカニズムおよび動的安定性）		

（論文内容の要旨）

A doctoral thesis of Mr. Tan NGUYEN, entitled “Load transfer mechanisms and seismic stability of embankments subjected to basal subsidence”, aims at two objectives: (i) investigate the characteristic of the load transfer mechanisms in loose embankments under conical and planar geometries (ii) evaluate the effect of arch formation to the seismic stability of compacted embankments.

This thesis investigated the load transfer mechanism of active and passive arch actions in embankments by using theoretical, experimental, and numerical solutions. Thereby, the characteristic of load transfer mechanism was examined and deepened, especially focusing on some overlooked problems. Furthermore, the linkage between arch action and the potential of liquefaction triggering in the sandy embankment subjected to the basal subsidence was also experimentally realized using dynamic centrifugal models.

To begin with the theoretical perspectives, the load transfer mechanisms in loose embankments under conical and planar geometries whose traction-free surfaces inclined at either the repose angle or less than the repose angle is examined. The embankments are subjected to a priori condition either passive or active condition was considered. The problems were established based on the assumption of incipient failure everywhere obeying the Mohr-Coulomb failure criterion in conjunction with the self-similarity assumption. Then, the problems were resolved using numerical methods; wherein, the 5th order adaptive Runge-Kutta integral method was implemented to integrate a pair of ordinary differential equations. Moreover, the radial stress jump condition and the numerical perturbation were also manipulated to deal with the stress discontinuity and singularity appearing during the integral process. On the other hand, the shooting technique was also put in place to facilitate the solution characterized as a boundary-value problem.

In relation to the numerical approach, an elastic model was also used to reveal the effect of basal subsidence on the stress redistribution in many geometric entities, e.g. triangle and trapezoidal embankments. The method of IsoGeometric Analysis (IGA) was employed to discrete the spatial domain instead of the classical Finite Element Method (FEM). The comparison between the two discretizing tools was also made to dominate the superiority of IGA over FEM in terms of computational resources.

Regarding the experimental approach, a series of static centrifugal model tests was carried out to realize the arch action occurred in compacted trapezoidal embankments. Furthermore, the efficiency of the experimental modeling of the basal subsidence using urethane was also evaluated. The characteristics of arch action occurred in the trapezoidal embankment were observed from the experiments such as the local minimum pressure in central vicinity of the embankment.

京都大学	博士（　工　　学）	氏名	NGUYEN　TAN

With regard to the experimental investigation on the linkage between the passive arch action occurrence and the seismic stability of sandy embankments, another series of dynamic centrifugal models of the sandy embankments subjected to the basal subsidence was conducted; wherein, the model preparations and the fluid supplying procedures were varied; and their effects on the seismic stability of the embankments against seismic loadings were also demonstrated. On the other hand, the failure modes of the embankments were observed with respect of the characteristic of the liquefaction occurrence inside the embankments. And then, the failure pattern of the arch collapse was experimentally characterized and examined. The outline of this thesis is described as follows:

Chapter 1: [Introduction] The research objectives, scope, and backgrounds are elucidated.

Chapter 2: [Stress distribution in conical sand heaps at incipient failure under active and passive conditions] The load transfer mechanisms in conical sand heaps are revealed whereby the contrasting features of active arch action and passive arch action were comprehensively disclosed.

Chapter 3: [Stress distribution in unsymmetrical planar sand heap at incipient failure under active condition based on numerical solution in conjunction with experimental validation] The active arch action in unsymmetrical planar sand heaps was presented. The numerical results were experimentally validated by 1G shaking table model tests.

Chapter 4: [Arch action in planar sand heaps under the plastic regime] The characteristic of the passive arch action in planar sand heaps under symmetrical and unsymmetrical geometries was demonstrated using the incipient failure everywhere solution.

Chapter 5: [Investigation of stress depression in sand heap using on the isogeometric analysis method based on elastic model] The characteristics of load transfer mechanisms in embankments were investigated by the plain strain elastic model.

Chapter 6: [Experimental realization of the arch action in trapezoidal sandy embankment subjected to basal subsidence] A series of centrifugal model tests was conducted to reveal the effect of basal subsidence on the stress redistribution in trapezoidal compacted embankments.

Chapter 7: [Insight seismic stability of embankments subjected to basal subsidence] The seismic stability of sandy embankments subjected to basal subsidence was investigated based on dynamic centrifugal model tests. At the same time, the linkage between the characteristic of liquefaction occurrence inside the embankments and the failure patterns was discussed.

Chapter 8: [Conclusions] The new contributions and findings from the scope of this thesis were comprehensively elaborated. Furthermore, the limitations remaining from this study were also named; therefore, the recommendation for future works was made.