

# Enhancing A Virtual City with Collective Memory

## *A pilot study of Jalan Malioboro in Yogyakarta*

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**Abstract.** *The paper reports on a pilot study of how a virtual city can be enhanced by interlinking elements of the 3D city model with the city's collective memory represented in various digital formats. A particular street called Jalan Malioboro in Yogyakarta Indonesia has been modeled and hosted on Google Earth. Through the questionnaires returned by the participating students, we also investigate how collective memory enhanced virtual city (CREATI) could help learners to achieve goals of a particular course. The study shows that CREATI helps students to analyze the task given by providing more historical information related to the street. However it also needs further refinement and evaluation by introducing more interactive features such as enabling students to upload their own design proposals and to post additional information related to the buildings or places.*

**Keywords.** *City modeling; collective memory; virtual city; Google Earth; architectural and urban design; Jalan Malioboro; e-Learning.*

## Introduction

The paper reports on a pilot study of how a virtual city can be enhanced by interlinking elements of 3D city model with the city's collective memory represented in various digital formats. In this study, a virtual city is defined as a 3D graphic model built through mirroring the city's real physical form, which can be accessed online through a Web browser. Collective Memory, on the other hand, refers to all kinds of records of the history of buildings and places in a city. We investigate how collective memory can be digitally reproduced and linked to a city's 3D virtual models. The outcome of collective memory

enhanced virtual city through this pilot study will be evaluated in terms of its effectiveness in supporting architectural and urban design learning.

A particular street in the historical City of Yogyakarta, Indonesia called Jalan Malioboro (Malioboro Street) has been modeled as Virtual Malioboro by the authors. Two students in the final year have helped modeling some buildings in the street. Samples of collective memory of Malioboro Street were collected and reproduced in various digital formats and then linked to Virtual Malioboro, which is now hosted on Google Earth. An evaluative study into the educational use of Collective Memory Enhanced Virtual City (CREATI) by students undertaking the Urban

Design course at the Department of Architecture, Atma Jaya Yogyakarta University is devised to collect the learning and teaching data for further analyses.

## Research Background

There are no doubt that virtual city models have been used widely to study the historical urban environments such as the Heusden Study (Alkhoven, 1997) and the Sheffield Urban Contextual Databank (SUCoD) project (Peng C, et al., 2002). The present study considers how students can be supported in using virtual city models for architectural and urban design learning. Investigating the social and architectural history of either buildings or a site is very important for students before making a design proposal. Achieving a balance between the memory of past forms and current needs is very important to create a design with uniqueness of relationship to site and place and to give identity and meaning to its users (Rossi, 1997; Blundell Jones et al., 1999).

This study aims to develop and test a conceptual framework for enhancing virtual city with collective memory to support architectural and urban design learning. It addresses the questions of how a city's collective memory can be represented digitally and linked to the city's virtual models. It also investigates how collective memory enhanced virtual city could help learners to achieve goals of a particular course as a way of evaluating the enhancement.

This study is conducted on the premises that by providing a city's 3D virtual models linked to its collective memory, students may become more knowledgeable to the urban contextual issues. It is expected that students will be better supported to develop more context-sensitive design proposals by working with such virtual models.

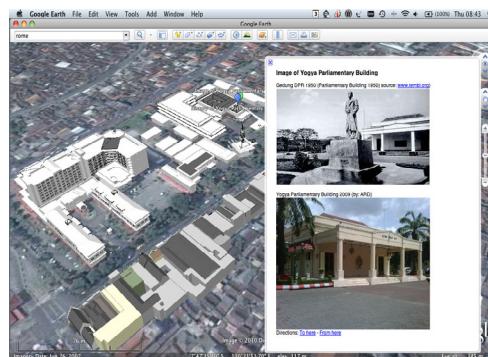
## A Collective Memory Enhanced Virtual City (CREATI): Concepts, Design and Implementation

The concept of collective memory have been

explained by many scholars, from a general definition of collective memory and how it can be reproduced and shared (Halbwach, 1920; Nora, 1989; Misztal, 2003) to its role in a more specific subject like architecture and urban design (Rossi, 1997). In reviewing these concepts, we develop the idea of collective memory applied in architecture and urban design learning as a kind of album representing a city in three-dimensional forms, not only displaying images but also telling the story behind them. The 3D city models become the interface through which any information related can be linked.

Unlike manual photo album or even digital photo frame which can be displayed and accessed only in a certain place, we design a 3D family album presenting the image and the story of a city that can be accessible online and can be updated by its members. In this shared 3D family album, the family members can participate and collaborate in adding and writing their own story through the virtual models.

We implement the concept by developing a 3D album of the virtual city of Yogyakarta. Malioboro Street was chosen to be modeled as it is found to be the most memorable places in the City of Yogyakarta. In the pilot study a 300-meter long section of Malioboro Street was modeled using SketchUp. It consists about 28 stores and 5 building complexes of which are historical buildings with Indische-Colonial styles. The collective memory enhanced virtual Malioboro is hosted on the Google Earth platform.



*Figure 1*  
*Samples of collective memory of Jalan Malioboro linked to the 3D models hosted on Google Earth.*

Samples of collective memory of Malioboro Street were collected and embedded into the 3D street models uploaded onto Google Earth. We use text, images, videos and any other digital information to narrate the story of buildings and places along the street (Figure 1).

In organizing the digital collective memory content of the 3D models, we interlinked the 3D models with digital resources found from many different websites. Sometimes we have to put digital photos in free Web albums such as Panoramio [1] so that they can be made available online and can be linked with the models on Google Earth. In the pilot study, we also tried to embed related video from YouTube [2] to narrate the story of buildings and places. “Balloon” is used as an information button for each model in which we placed HTML codes referenced to a photograph, images or video from the relevant websites. So whenever the 3D models are selected, collective memory related to the models will appear.

## Pilot Application of CREATI in a Design Education Setting

As a research prototype, CREATI is mainly intended to be used in a design education setting. We test the effectiveness of CREATI in the Urban Design course at the Department of Architecture, Atma Jaya Yogyakarta University. The course aims to facilitate learning process through which students have an

understanding about the importance of urban space for their inhabitants either as a place for social gathering, cultural actualization or as recreational facilities. As part of the course assignment, students are asked to propose design of urban spaces based on the analysis of urban form quality and the design concepts of urban space [3].

In this pilot study a Google site is being developed as a single point entry in which students can have direct access to CREATI as well as any information about the Urban Design course including the assignment [4]. Through the site, students are able to download 3D models embedded with historical information and to analyse them. They also can edit the models and propose new designs in response to the task requirement of the design course (Figure 2).

When the pilot study was conducted in March 2010, there were ten students willing to involve in the study, but only five of them returned the questionnaires in the end. As it is available online, students can access CREATI at their homes, in the University’s computer lab, or via a rental Internet provider. The students were asked to give feedback by filling in the questionnaires. Besides the questionnaires, the students were asked to talk about the problems experienced when using CREATI.

## Evaluating CREATI as an e-Learning Environment

We consider that the effectiveness of CREATI as an e-Learning Environment could be best evaluated through a questionnaire exercise participated by the students undertaking the Urban Design course at the Department of Architecture, Atma Jaya Yogyakarta University. We design the questionnaire to elicit students’ reflections on a number of issues such as enabling collaboration, analyzing the urban context, visualizing design proposals in the 3D city context, and getting feedback. The outcome of evaluating the current pilot study of CREATI is presented in the following six questions raised with the participating students.

*Figure 2  
The project’s Google site as a single entry point for accessing CREATI and Urban Design Course resources.*



*Question #1: Have you had experiences in using SketchUp, Google Earth and Google 3D Warehouse?*

This question is intended to reveal the background knowledge of the participant in using different kinds of software, which might influence on how they use and interact with CREATI. This will be useful to develop the design of CREATI for learning purposes.

In general, students know SketchUp and Google Earth well. They are adequately familiar with using SketchUp for 3D modeling. ArchiCAD or AutoCAD was taught to all architecture students in semester two as part of a compulsory subject. Students frequently use Google Earth although most of them intend to capture images for showing a map of certain location. But the survey finds that there are few students with experiences in using Google 3D Warehouse through which they can download any 3D building models available on the Web and display them on their Google Earth.

CREATI is designed as an alternative way to download and display 3D models as in Google 3D Warehouse. Unlike Google 3D Warehouse, which provides different kinds of 3D model files (\*.kmz, \*.skp, \*.zip) to be displayed in different software, CREATI only provides files in the kmz format. Students have to import the files when they need to open and edit the models in SketchUp. Through the site, students were asked to download Malioboro 3D models in order to be displayed on their Google Earth. Some problems had been experienced by the students at the early process such as models were invisible, and models were displayed only in the upper side (i.e., sink too deeply).

*Question #2: How do you collaborate with your fellow students when using CREATI?*

The task in the Urban Design course is designed for a group consisting of 4-5 students. Students can choose urban sites they will work on, which could either be public open spaces, street spaces or a combination of them. For the urban design task, students are asked to submit a re-designed and revitalized proposal, or to hand in a new designed proposal.

Unfortunately, due to the limited number of participants, the effect of CREATI on students' collaboration was difficult to be measured. Among the participants, no students were in the same task groups. As a result, in the pilot study, students were asked to assume how they will collaborate with members of their group when they use CREATI.

The study shows that students are most likely to collaborate in the same time and place as well as in a different time but the same place. The result is quite surprising. As a Web-based online facility, CREATI should support collaboration among users in a more flexible way, which should not depend on specific times or places.

There are two ways of sharing the models and information embedded among the participants. It depends on whether the participants are invited as collaborators or viewers. As collaborators, students can download the models. After editing the models or embedding more information related in particular software, they can upload the models back into the site. In the site, they can move the files into different folder or delete unused files. It is important to note that some rules about modifying the files should be given among the student participant to avoid unnecessary problems. On the other hand, as viewers, students are only able to download 3D models but they cannot upload the updated ones.

*Question #3: How important is the feedback given by other people?*

Students can give feedback to the other participants by giving comments or asking questions. However it also depends on the status of the participants whether they are invited as a collaborator or a viewer. As a collaborator, student can use the "Comments" button to post messages on someone's work. While giving feedback, they can attach files when it is needed. As a viewer, participants are only able to use the "Asking questions" button through which they can contact the tutor for asking or giving feedback to someone's works. They cannot upload files.

In the pilot study students argue that they need feedback not only from the course tutor, group

members, or other course participants but also from open users. An open user refers to any person, who is not taking the course. As the site is made publicly, anyone can view the site. Therefore there is an urgent need to improve the site by giving more access for open users to give feedback for students. A kind of group discussion with open member might be useful so that open users can post messages as well as read the archives or download the attached files.

*Question #4: How important is the quality of 3D models in CREATI?*

In developing their design, students can download the existing 3D models embedded with digital collective memory through the site provided by Google. They are able to edit the models in SketchUp and produce new designs according to the task requirement of the design course.

It is found that the availability of the 3D models complement the data the students get from the field survey, which are sometimes difficult to be collected. Generally, they have to search data from various places such as the City Council, Town and Planning Bureau, Internet, etc. Therefore, the students argue that in order to support the assignment, accuracy of site dimension become the most important thing for them compared to other factors such as building dimension accuracy, interactivity, textures, level of detail, and entourage availability. Accuracy of site dimension is important because the existing buildings in Malioboro Street are very dense. This makes building site dimension can only be measured from one or two sides and without any chance to measure from the backside. Meanwhile, finding an accurate and up-to-date geographic map like ones provided by Ordnance Survey in the UK is difficult. They might be available for certain purposes but not publicly. In CREATI, 3D street models were developed by tracing the site boundary from the satellite images provided by Google Earth. Therefore, the accuracy of the site dimension depends on the resolution of the map provided by Google Earth.

From the pilot study, there is an emergent need not only to model building sites but also sites of

open spaces and pedestrian walkways as well as the streets. Students sometimes were asked to design new functions in open spaces based on the activity supported and how to treat the ground. By providing the street models (both for vehicles and pedestrians), it will give students ideas how to deal with the transportation and circulation problems (Figure 3).

In CREATI, some models were developed by giving texture from the real photos or satellite images from Google Earth. Meanwhile other models were in basic mode without any texture attached. For some students, the appearance of models without textures makes them slightly difficult to be recognized with reference to the Malioboro Street.

*Question #5: How important are the types of collective memory linked to the 3D models?*

We have defined and developed the content of collective memory as history of building and places, cultural and historical events, festivals, and community activity, which were presented into different formats. In terms of digital format, image is found to be the most helpful form of collective memory for urban analyses followed by text, video and audio format. Digital images interlinked to 3D street models reveal how the buildings looked like in the past and have changed through the time. However, as the images are linked to resources from many websites, it should be attentive to check the validity of the data such as the sequence of events.

From the pilot study, there appears an urgent need to add more detailed information in several areas. Information about activity support, transportation systems, and architectural details of historical buildings are among mentioned by the students.

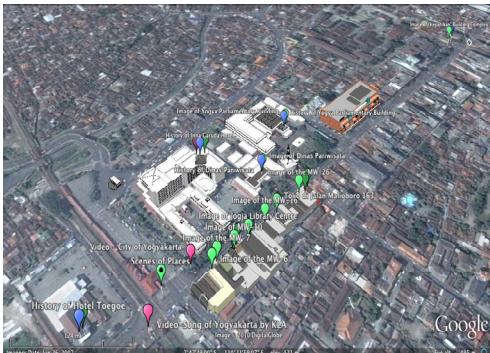
Presenting collective memory through the use of different coloured balloons needs to be reconsidered for the next phase of study (Figure 4). The appearances of many balloons on display were slightly annoying because when selected, the models will be blocked. Designing flexible balloons as a pop-up menu or able to be removed should be the next improvement in developing CREATI.

*Question #6: In which aspects of urban space do*

*you find collective memory linked to models helps you to make urban analysis?*

We develop the questionnaire for urban analyses based on Gordon Cullen's Townscape design (Cullen, 1971) and Raymond J Curran's Urban Experience (Curran, 1983). There are about 16 items of urban quality, which students have to evaluate through the use of CREATI.

According to the students, CREATI helps them most to exam the urban fabric quality. It displays evidence of differing periods in its architectural styles especially the scale, proportion and facades/surfaces which showing the image of the city. However, it has to be noted that the 3D models in CREATI were built without including too many details such as building textures as they were intended to be shown as online



models so that the 3D files could be kept small.

Historical texts and videos help students to explore the historical background of the buildings as well as events happened around buildings and urban places. Some videos were taken from a piece of film or a song that sometimes indirectly explained the place.

## Conclusion and Further Research

The results of the current pilot study reveal that in general CREATI is considered useful by the participating student users in supporting their architectural and urban design learning. The study did not attempt to measure the impact of the use of CREATI on the students' final assessment in the course.

The pilot study shows the importance of the collective memory interlinked with the 3D models for learners. It helps students to analyze the tasks given by allowing immediate access to more historical information related to the urban setting. They are also better supported to develop their design proposals by having collective memory linked to the virtual city models accessed. However, suggestions are made by students to develop the study further such as the availability of information related to a site or places for proposing a new design including building regulations (Floor Area Ratio, Building Coverage Ratio, etc.) and historical maps/site plans over several periods of time.

The Virtual Malioboro Street as a specific implementation of CREATI also needs further refinement and evaluation by introducing more interactive features such as enabling students to upload their own design proposals and to post additional information related to the buildings or places.

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*Figure 3  
Models of building in Jalan Malioboro with street and pedestrian walkways are needed to deal with transportation and circulation problem*

*Figure 4  
The appearance of balloons with different colours and contents.*

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