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# Sustainable Transport System: A Wheel Based Interactive Information Installation

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**Abstract**

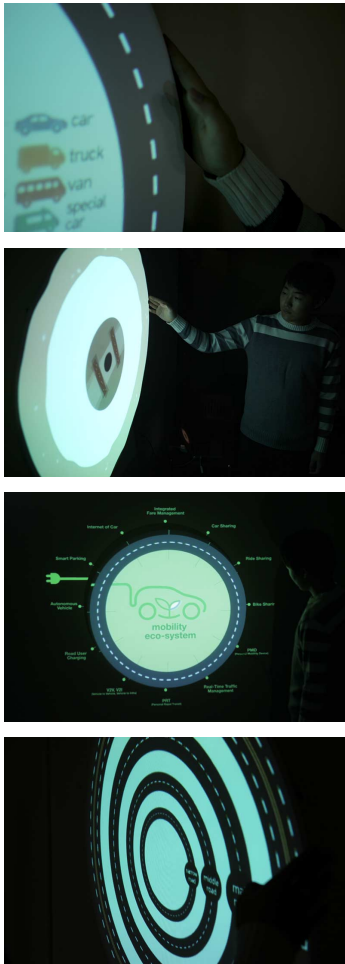
Sustainable Transport System is an interactive wheel based information installation where users can watch the information projected on the wheel with a narration. Its information consists of 9 questions that are related with road transport systems ranging from 'The history of road traffic' to 'How will the sustainable traffic system evolve in the future?' The circular interface was used to show information in a pie chart, diagram and history of wheel. This interface contains the meaning of sustainable circulation. The modalities of the project are Vision, Sonic, and Touch. A potentiometer sensor is mounted onto the center of wheel, which is linked with Flash action script through Arduino as the technical method. The user enables the information to be navigated by rotating the wheel clockwise from No.1 to No.9 and counterclockwise from No.9 to No.1. CHI attendees can experience the information ranging from history of road transport to necessity of sustainable transport system easily, interestingly and engagingly.

**Author Keywords**

Physical wheel interface; interactive information; rotating interaction; projection mapping

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous. See:



**Figure 1:** The user enables the information to be navigated by rotating the wheel.

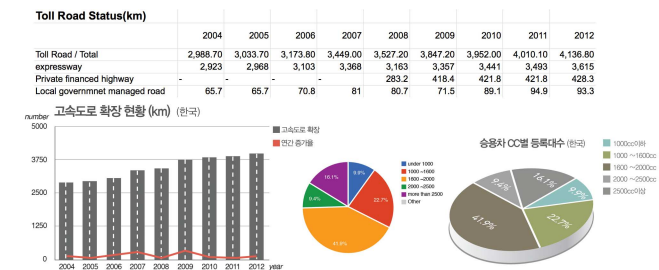
## Introduction

Major cities around the world are recently suffering from traffic jams, air pollution and an increase in emission of greenhouse gases due to the increase in the number of cars. The modern transportation system enabled the life of a mega city but it carries the risk of threatening the sustainability of the cities in the future. We can see that as road congestion costs rise rapidly due to the explosive increase in traffic needs along constant urbanization and increasing complexity in the traffic system. The sustainable traffic system in the future should correlate with various means of transportation, services and infrastructure to maximize individual mobility and access to ecosystem macroscopically to accomplish FAST(Flexible, Affordable, Sustainable Transportation) [1] so that government, enterprises and individuals cooperate and compete with one another. This project aims to deliver information through the interaction that rotates the wheel so users can understand how the sustainable traffic system that includes smart road system evolves in the future as well as the plan to support that as the solution for the problems of road transportation systems major cities around the world share. The production process of this project follows the flows of road transportation-related statistical data research, information design, motion infographic, interface design, programming and physical installation.

## Road transportation-related statistical research

It researched the road transportation-related statistical data of Korea from Korean Statistical Information Service [2] based on quantitative data to visualize the data. The researched data include the number of registered cars according to their types, annual increase rate, number of the registered cars according

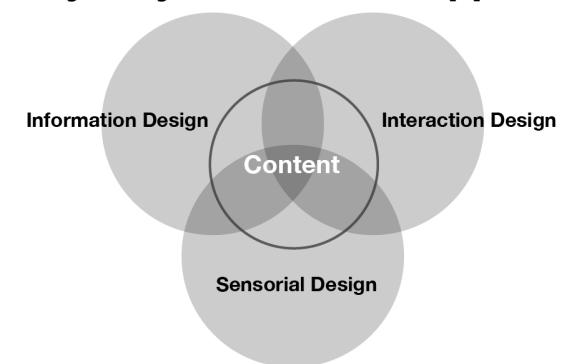
to displacement volume of private cars, traffic congestion costs, status of highway expansion and toll road. Statistical Charts that were drawn from the research are as below.



**Figure 2.** Road transportation-related statistical research

## Information Design

The following is the description that summarizes the contents of Sustainable Transport System Project according to Diagram of Nathan Shedroff [3].



**Figure 3.** Nathan Sedroff's diagram of intersection keywords about information interaction design

\* Information Design: It visualized the information with aesthetics along the context of each question like



**Figure 4:** Installation images of the project.

mapping the road to the graph when graphing the researched road transportation-related data. Color concept, type system and production method of information design elements were decided along with tone and manner and branding work was carried out too.

\* Interaction Design: It used the clue of rotation that is an Affordance property of the wheel and is designed to enable information to be navigated intuitively through rotating interaction of clockwise and counterclockwise along with mental model of the users.

\* Sensorial Design: It used multi-modalities that are touch and rotation by the hands, understanding on information by the eyes, hear the narration with ears.

### Motion Graphic

It treated the background in black color so that it enables projection mapping onto the wheel with a total playing time of 4 minutes 30 seconds and contained the motion that starts from the center to go with wheel interface, which rotates mainly in a circle. The narration is synchronized with the contents of motion and background music plays together while the movie clip plays.

### Wheel based interface design

The diameter of circular structure is 88cm and the size of the circle was decided in consideration of legibility of the texts that are projected onto the wheel with the size that a standing adult can rotate through the tests. It was made of lightweight materials so that the wheel can be rotated easily as much as possible. Small circular plate supports under the circular plate and potentiometer is connected to the center of small

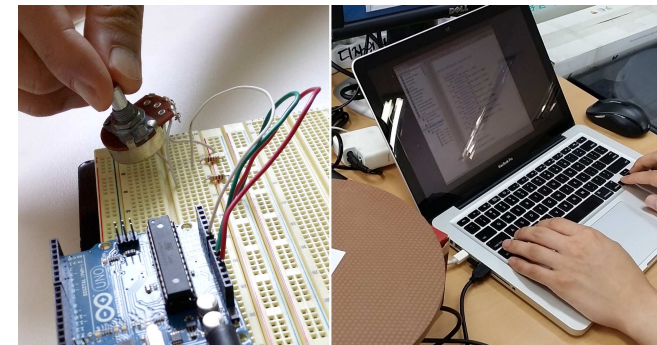
circular plate. A potentiometer is fixed onto the box that has Arduino [4] inside and connected to computer with USB cable.

### Technical process

Hardware consists of PC, Projector, Arduino and Potentiometer for Sustainable Transport System. Technical Process consists of Physical Input level and Digital Output level as below.

Physical Input: It receives the analog input values when rotating the circular plate with user's hands.

Digital Output: It offers the values of Potentiometer through the projector as the selected image from 9 movie clips in flash software of computer that is linked with Arduino.



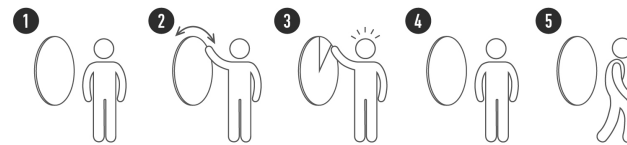
**Figure 5.** Test image of the connection between physical input and digital output.

\* Range of potentiometer signal values and movie values of each range according to their levels

\* It plays the movie in the same section when the user does not rotate the wheel.

### User interaction Scenario

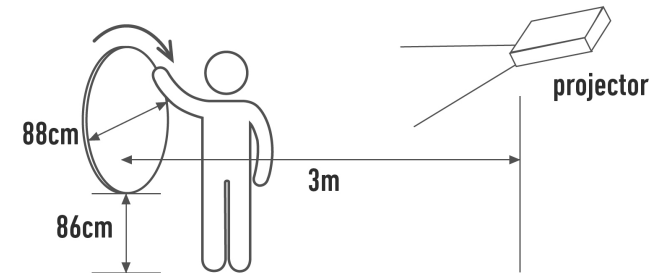
In case of User Interaction Scenario, it applies the mechanism that enables the users to use it simply, easily and intuitively as much as possible according to User Mental model clockwise and counterclockwise together with Affordance [5] clue of rotation.



**Figure 6.** User Scenario

1. User stands in front of physical wheel interface.
2. User rotates the wheel clockwise or counterclockwise.
3. User experiences the way of information navigation that goes to next section chapter in serial order along rotation angle.
4. User puts his or her hands down and watches the information when it indicates that.
5. User moves to the next after searching and watching the information in the same way.

It reflected the results of user tests and their opinions with respect to emotion, usefulness and usability.



**Figure 7.** Floor plan

Lastly, we hope this project plays the role of enabling CHI attendees understand the concept and necessity of sustainable transport system interestingly and in a friendly manner and help cause small changes when using public transportation.

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