

### **Study of stability and comfort of light pedestrian walkway (trainee: Giakoumakis Pavlos Paris)**

The static stability of light pathways can be effectively assessed through a number of approaches developed in the fields of mechanical and civil engineering. On the other hand, the dynamic stability of light pathways represents an underexplored field and only in the last years the comfort of such structures have been investigated. Basically, if a given pathway tends to oscillate, then pedestrians feel unsafe and try to escape. Consequently pedestrian can hurt themselves while escaping from the pathway. Indeed the study of the comfort of light pathways is fundamental to guarantee safety of pedestrian and strongly depends on the mathematical model employed to stimulate the structure.

The scope of this work consists of developing new statistical models for pedestrian walk suitable to accurately assess the dynamic stability of light pathways. We have employed an instrumented floor to acquire various characteristics of the pedestrian walk. In particular, more than 100 students have been enrolled in the experimental campaign. Currently we have statistically characterized the walk of 3 students in terms of force, time and position of steps. Our new model is based on a Markov chain capable of describing the intrapersonal variations of the pedestrian walk. Preliminary results have evidenced significant differences with respect to unpractical classical approaches based on perfectly periodic excitation of the structure.

The activities assigned to the trainee Giakoumakis Pavlos are

- Extending the statistical model (devised for 3 student) to the whole population enrolled in the experimental campaign. This means identifying and extracting a set of parameters suitable to characterize the interpersonal variability of pedestrian (weight, height, type of step, ...).
- Developing a software simulator (in Matlab code) capable to generate the walk of any number of pedestrians
- Interfacing the developed simulator to the existing software for the comfort assessment of the structure
- Devising a statistical description of a group of pedestrian walking of the pathway. Correlation is expected since the velocity of the group is related to the slowest element. A Gaussian behaviour is expected as the number of pedestrian is getting large.