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Nastaran Tebyanian, Master of Science in Landscape Architecture (expected 2016) is the recipient of the Michael Brill Grant Award in Urban Communication and Environment Design.

Named in honor of Michael Brill, architect and longtime EDRA member, for his leadership in workplace environments and communication, this grant is funded by the Urban Communication Foundation and administered in conjunction with the Environmental Design Research Association. The goal of this grant program is to encourage innovative research projects that provide a bridge between the fields of communication and environmental design.

Developing an Online Platform for Participatory Resilient Urban Landscape Design

by Nastaran Tebyanian

Resilience is defined as the ability of a system to absorb changes, self-organize and increase its capacity for learning and adaptation (Cumming, 2011; Field et al., 2012). The increased attention to designing resilient urban spaces in environmental design disciplines is a timely response to today's fast changing world (Wallace and Wallace, 2008; Wu and Wu, 2013). It is believed that the shocks that today's cities may face are different from those in the past in terms of their scale and pace due to globalization and climate change. Rapid depletion of natural resources and the increasing frequency of ecological events have been mentioned as factors that make resilience a timely focus (Eraydin & Taşan-Kok, 2013).

The character of resilient systems such as self-organization, adaptation and learning can be traced in many vernacular urban systems in which citizens responded to social and environmental problems when and where they happened (Alexander, 1964). However, modern changes in city design and management and increasing complexity of our built environment have disrupted these bottom-up processes. At the same time, we have developed powerful computational communication theories and tools such as collective intelligence systems to harness the power of crowds (Geertman et al., 2015; Malone et al., 2009; Pentland, 2014). Collective intelligence has been seen as a problem-solving model applicable to many kinds of problems, specifically, wicked problems (In-

trone et al., 2013). Although collective intelligence system is not a new idea, the advent of internet created unprecedented potentials for collaboration amongst large groups of people across different locations through online communication platforms. Despite the potential of these online collective intelligence systems/platforms, they have been rarely used by environmental designers for facilitating bottom up processes that are essential for creating resilient urban spaces, This study explores: *how can we use collective intelligence systems and related communication tools to facilitate self-organization and collective efforts for increasing the resilience of urban systems at multiple scales?*

This research in-progress argues that an online collaboration and communication tool for urban design that provides both an expert system and a platform for harnessing the indigenous knowledge of people can result in directing our urban systems to a more resilient level. My research proposes "making as a method of inquiry in order to address wicked problems" (Zimmerman et al., 2007, p. 496). Here the wicked problem is how to facilitate collective efforts for increasing resilience of our urban landscapes; while the creation of the artifact (co-design tool) represents the "making" component of the method. In addressing the problem, first, I have identified the potential of using computational theories and tools (such as collective intelligence systems) for catalyzing sustainable behavior in communities to achieve resiliency goals in multiple scales. I have examined how we can design an expert system which provides users sound strategies and ideas for deigning resilient urban landscapes. Second, through the process of ideating, iterating, and critiquing potential solutions, I am developing prototypes of an online co-design tool as a research artifact that embodies the identified theoretical and technical potentials (Zimmerman et al., 2007). Figure 1 shows the structure of the co-design tool as the combination of a collective intelligence and an expert system. The design process is separated into initiation, design, and evaluation steps (Figure 2). Figures 3 through 8 illustrate a prototype of the application.

The focus of this co-design tool[1] is on urban planting design at the scale of small landscapes such as rain gardens and permaculture gardens. This focus is chosen mainly because small-scale landscapes have tremendous potential for increasing the resiliency of urban systems under climate change scenarios through their important role in water management and food production. These potentials remain under or unutilized due to the high cost of accessing experts' knowledge, tools, and materials, and lack of motivation among many citizens that is at least partially based on the perceived lack of knowledge to tackle such issues. The co-design tool provides - designers, citizens and organizations a platform to: 1) find potential sites, 2) design and evaluate landscapes and 3) share their knowledge, experiences and even materials/tools needed for their projects. The app evaluates citizen-designed planting schemes based on ecological resiliency rules and shows different scenarios under extreme environmental events. Through informing users by means of visualized data related to their resources and performance and social mechanisms such as peer pressure, the tool aims to catalyze behavior change and citizen engagement in the design process for reaching collective urban resilience objectives.

The third step of this research is to turn the developed prototypes of this co-design tool to a first working version of the application and then test and evaluate the tool with groups of participants. In doing so I need to collaborate with a programmer during the app development process. The first target is writing codes for developing a web application with HTML 5 that can work across platforms and devices. Once the application is ready for deployment I will test it with about 10-15 students at Penn State. The results of this project will be disseminated through journal publication and launching a website that includes introduction to the research and the web application.

[1] Co-design tool, application and app have been used interchangeably in this document.

The timeline and budget for this research is as follows.

Research Timeline in 2016	
Feb.-April	Wrapping up theoretical framework and prototype development
May-June	Working on web application development- iteration, refinement and debugging (Working with the programmer)
July	Developing a controlled game-like lab experiment for evaluation of the app
Aug.-Sep.	Workshops with participants (students)
October	Analyzing workshop data. Based on analysis, alteration will be listed for refinement of the application
November-December	Launching the website and writing the research paper (Target journal include Landscape and Urban Planning, Landscape Journal, Simulation for Architecture and Urban Design proceedings.)

Research Budget	
Hiring a programming consultant (student)	Wage cost for working 130 hours @ $15/hr = $1950
Android Tablet	For testing the prototype = $319 available from *http://www.amazon.com/Google-Nexus-Tablet-8-9-Inch-Black/dp/B00M6UC974/ref=sr_1_1/191-2692135-8441135?ie=UTF8&qid=1456504401&sr=8-1&keywords=tablet+nexus+9*
Workshop	Student participation incentives (15 participants)= $10 per person= $150
	Printing and supplies= $ 50
Total	**$2469**

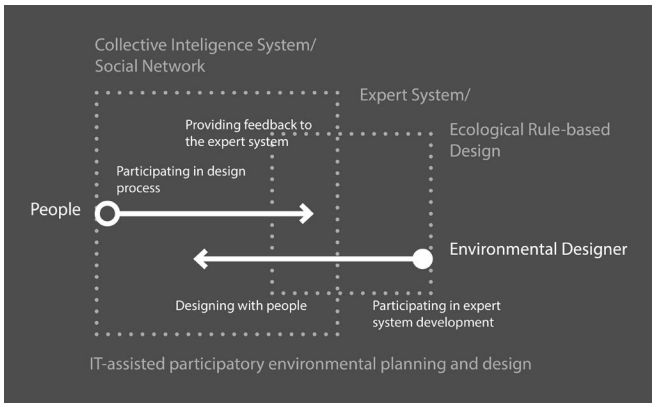

Figure 1 *The structure of the co-design tool and the role of people and environmental designers in an IT-assisted participatory environmental design platform*

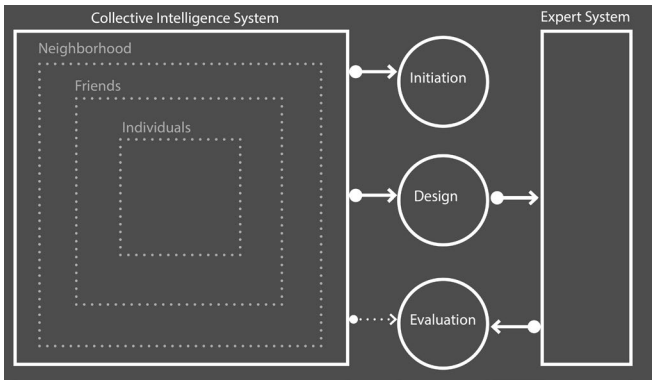

Figure 2 *The three steps of the environmental design in relation to the collective intelligence and expert systems.*

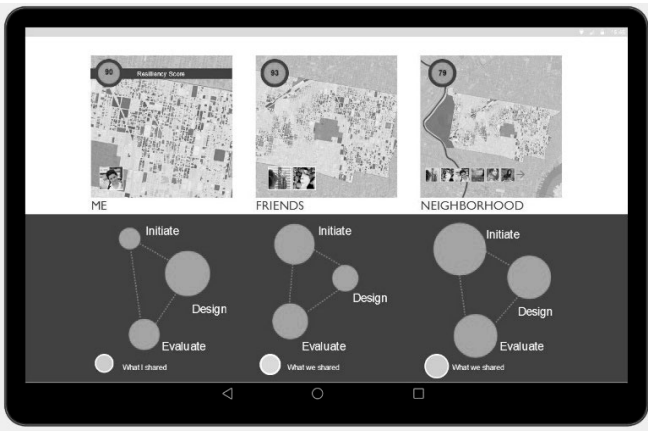

Figure 3 *the screenshot from the co-design tool prototype shows the different steps and levels of engagement*

Figure 4 *the initiation step in which a user can initiate a green space project such as rain or permaculture garden. The user can make his/her project accessible to their people to design and/or evaluate*

Figure 5 *Users can browse all on-going projects and participate in ones that are open to design and/or evaluate phases*

Figure 6 *The example of one project proposal that is both open to design and evaluate phases*

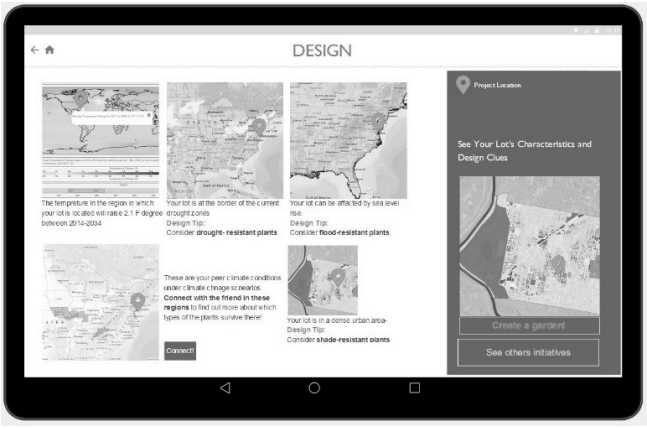

Figure 7 *Here in the design step, the expert system provides analyses of the design site under climate change scenarios and suggests strategies for a more resilient design*

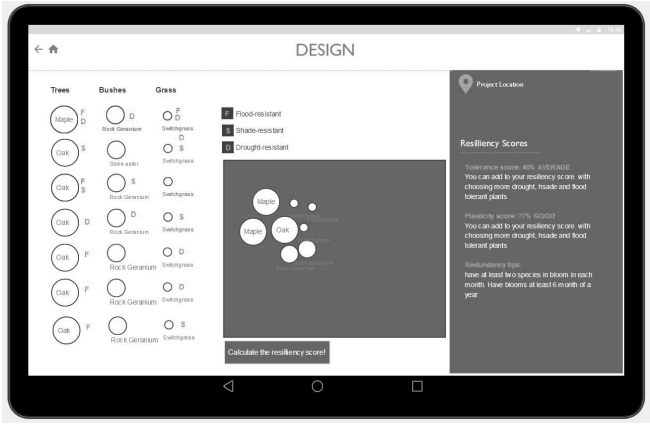

Figure 8 *The user can choose different species from a repository of plants and the expert system provides resiliency scores calculated based on ecological resiliency rules*

About the Author:

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