



Rise of the Robo-Drivers: "Magic Roundabouts" as a Test Case for Autonomous Driving

Utilized computer vision and machine learning techniques to program a robot to autonomously navigate through nested roundabouts.

Abstract

"Magic Roundabouts" are one of the most challenging traffic junctions for human drivers. These roundabouts are an amalgamation of a central traffic circle moving in the counterclockwise direction surrounded by five to seven "mini-roundabouts" with traffic moving in the opposite direction. My goal was to have an autonomous vehicle use a machine-learning framework to navigate through one. To accomplish this, I built a self-driving robot and a physical, small-scale model of a magic roundabout for it to drive through. This model consisted of lane markings, arrows, and signs that the robot could visually recognize with a camera as well as multiple entrance and exit pathways. Using a combination of localization, sensory input, and driving policies, I employed computer vision techniques to predict where to drive and how to get there. Moreover, I tested various path combinations to determine the efficacy of the vehicle and areas of improvement.

Methodology

I built a robot using the DiddyBorg robot kit, Raspberry Pi, Pi Camera, and NAVIO inertial measurement unit. I then created a physical model of the magic roundabout. I implemented driving policies using computer vision and deep learning frameworks (OpenCV and TensorFlow libraries) in the programming language Python.

References

- Ali, Mohammed AH, Musa Mailah, and Tang Howe Hing. "Path planning of mobile robot for autonomous navigation of road roundabout intersection." *International Journal of Mechanics* 6.4 (2012): 203-211.
- Pérez, Joshué, et al. "Autonomous driving manoeuvres in urban road traffic environment: a study on roundabouts." *IFAC Proceedings Volumes* 44.1 (2011): 13795-13800.
- Chen, Chenyi, et al. "Deepdriving: Learning affordance for direct perception in autonomous driving." *Proceedings of the IEEE International Conference on Computer Vision*. 2015.
- Ziegler, Julius, et al. "Making Bertha drive—An autonomous journey on a historic route." *IEEE Intelligent Transportation Systems Magazine* 6.2 (2014): 8-20.
- Mitrovic, Dejan. "Reliable method for driving events recognition." *IEEE transactions on intelligent transportation systems* 6.2 (2005): 198-205.

The Red Lanterns: On the Girls and Young Women Who Did "Not Fear Dirty Things"

This research focuses on the actions of the women's group the Red Lanterns during the Boxer Rebellion, and how their image was used during China's Cultural Revolution, as well as in American cinema.

Abstract

Though the Boxer Rebellion is often depicted as a "young-men's movement," girls and young women were an undeniable presence. Formed in 1900, the Red Lanterns were members of an all-female sect that aimed to expel all foreigners from China. They constructed a model of femininity which challenged existing gender restrictions and allowed them to practice martial arts publically to demonstrate the threat they posed imperialist forces, fight in battles, and work unhindered as nurses, spies, and cooks. The belief that they could perform supernatural feats, was reflected in the American film *The Red Lantern* (1919). During the Cultural Revolution in the 1960s-70s, the Chinese Communist Party adopted and repurposed the Red Lanterns; they were paralleled with the Red Guards, reflected symbolically in the Model Revolutionary opera *The Red Lantern*, and, because of the way the group had resisted traditional feminine construction during the Boxer Rebellion, used as anti-Confucian ammunition. (149)

Methodology

I studied peer-reviewed research on the Boxer Rebellion and the Red Lanterns' historical role, then analyzed depictions of the Red Lanterns in plays and propaganda created the Chinese Communist Party in the 1960s-70s, as well as early 20th century American film to gain insight into the Red Lantern's mythologized legacy. (50)

References

Ch'ên, Jerome. "The Nature and Characteristics of the Boxer Movement--A Morphological Study." *Bulletin of the School of Oriental and African Studies University of London*. Vol. 23, No. 2 (1960): 287-308. JSTOR. Web. 14 Nov. 2015.

Cohen, Paul A. "The Contested Past: The Boxers as History and Myth." *The Journal of Asian Studies* 51.1 (1992): 82-113. JSTOR. Web. 14 Oct. 2015.

Cohen, Paul A. *History in Three Keys: The Boxers as Event, Experience, and Myth*. New York: Columbia UP, 1997. Print.

Ono, Kazuko, and Joshua A. Fogel. "Chapter 3." *Chinese Women in a Century of Revolution, 1850-1950*. Stanford, CA: Stanford UP, 1989. 47-53. Print.

Ouhong, Weng, and A. Jia. *The Red Lantern*. *The Columbia Anthology of Modern Chinese Drama*. Trans. Brenda Austin and John B. Weinstein. New York: Columbia UP, 2014. 519-55. Print.

A Lacrimis Romae ad Pacem Romana: From the Tears of Rome to the Roman Peace

How the rise of the Roman Empire highlights vulnerabilities of republicanism in nation-states of the modern era.

Abstract

The evolution of Rome's long-lasting representative republicanism portends vulnerabilities of modern nation-states. In the 1st century BCE, following Julius Caesar's assassination and Augustus's rise to power, largely through exploitation of cultural biases, the Roman state was in a military, political, and ideological crisis that forced each citizen to grapple with what defined his Roman citizenship. Was preservation of Rome's world dominance justification for skirting the republican constitution, the governing foundation of the past 500 years? Could Rome still be Rome if it was not a republic, but instead a permanent dictatorship? Most Roman citizens would say no. Yet Augustus was able to usurp power, rule as a stable emperor, and become the most admired Roman ruler of the millennium, all through exploiting, first, his predecessors' failures to maintain the façade of the "reluctant ruler" in order to placate the tyrant-fearing Senate and, second, propaganda to claim that he was the Republic's preserver, rather than its final dictator. (157)

Methodology

After reading, in Latin, texts by Livy, Cicero, Ovid and Caesar on the Republic's fall and the Empire's rise, I wrote my Honors Western Civilization paper, using primary and academic sources, on Augustus' ascent and the redefinition of the Roman citizen: ideas relevant today as another populist strong man seeks to control the world's most eminent republic. (57)

References

Cicero. *Philippics 1-6*. Edited and translated by D. R. Shackleton Bailey. Revised by John T. Ramsey, Gesine Manuwald. Loeb Classical Library 189. Cambridge, MA: Harvard University Press, 2010.

Heldaas Seland, Erwind. "The Periplus' Report Of A Roman Attack On Aden: An Unintended Result Of Successful Propaganda?." *Symbolae Osloenses* 80.1 (2005): 60-67. Academic Search Complete. Web. 12 Feb. 2017.

Powell, Anton, ed. *Roman Poetry and Propaganda in the Age of Augustus*. London: Bristol Classical, 1992. Print.

Salmon, Edward Togo. *A History of the Roman World from 30 B.C. to A.D. 138*. 4th ed. London: Methuen, 1963. Print.

Virgil. *Aeneid*. Trans. Robert Fagles. N.p.: Penguin Classics, 2009. Print.

This Land is MY Land: Using Ethnic Grocery Stores to Study Changing Suburban Diversity

An examination of how suburban culture is changing through the addition of diverse grocery stores

Abstract

The stereotypical view of gentrification has negative connotations as urban areas lose their artists, people of color and blue-collar workers. But as gentrification has swept areas such as San Francisco and Oakland, thousands of people are moving into suburbs, bringing with them cultural diversity. The East Bay, specifically Eastern Contra Costa County, has seen more than 153,500 new residents between the years of 2010 to 2013; additionally, over 53% of its population makeup is now non-white, compared to 41.7% in 2000. Has the rise in population and ethnic diversity primarily been caused by gentrification or other factors? What do these new waves of people bring with them that adds more depth to the newly settled communities? By utilizing small ethnic grocery stores as an indicator of this change, my research investigates the reasons as to why these newcomers arrived and challenges the supposed view that gentrification is wholly detrimental to the community. (152)

Methodology

Historically, Asians are new to my community; therefore, I identified over ten small, local Asian grocery stores and collected data such as customer demographics, growth projections and the owner's motivation for opening in that location. Through synthesis I will discover their impact on the community and whether urban displacement was the primary reason for resettlement. (55)

References

- "A Diverse and Changing Population." San Francisco Bay Area State of the Region. N.p., n.d. Web. 8 Feb. 2017.
- Blake, Shaquina. "Gentrification in San Francisco Is Supplanting Culture, Not Creating It | Shaquina Blake." Opinion. Guardian News and Media, 15 Feb. 2015. Web. 08 Feb. 2017.
- Hudson, Adam. "The Bleaching of San Francisco: Extreme Gentrification and Suburbanized Poverty in the Bay Area." Truthout. N.p., 27 Apr. 2014. Web. 08 Feb. 2017.
- Pottie-Sherman, Yolande. "Authenticity with a Bang: Exploring Suburban Culture and Migration through the New Phenomenon of the Richmond Night Market." Urban Studies, 13 Sept. 2016. Web. 13 Feb. 2017.
- Trinidad, Elson. "The Asian American Supermarket: More Than Just a Grocery Store." KCET. N.p., 09 Feb. 2016. Web. 13 Feb. 2017



The Invasion of the Oxygen Snatchers Part II: The Effects of Wavelength Variation on Plant Growth

An experimental investigation to determine the effects of varying wavelength exposure on *Egeria Densa*- an aquatic invasive species which creates oxygen depleted conditions within California's freshwater ecology.

Abstract

Egeria Densa is an aquatic plant native to South America, which has made its way to every continent other than Antarctica, and whose invasiveness has reduced aquatic plant diversity globally. Understanding the conditions under which this invasive plant thrives is crucial to restoring long term ecosystem stability, particularly in the Sacramento-San Joaquin Delta, where *Egeria* has posed many ecological, recreational and financial problems. Several studies have been conducted on the relationship between different wavelength exposures and plant growth. They have shown that blue light affects photosynthesis rates and induces stem elongation. However, there are virtually no studies which explore wavelength's effect on *Egeria densa*. What specific effects do wavelength differences have on this particular predator? Our presentation will describe our intricate experimental design along with collected data on factors such as stem length, photosynthesis rate and chloroplast conditions. Our results show a direct correlation between red wavelengths and exponential plant growth. Information gathered will help scientists understand how this plant is able to proliferate.

Methodology

After collecting water samples from Discovery Bay to use as mediums, *Egeria Densa* is being tested under various light wavelengths. The plant's growth will yield qualitative and quantitative data based on pH, temperature, salinity levels, photosynthesis rates, and dissolved oxygen output. Plants will be measured using a caliper and will be analyzed under a microscope.

References

- Durand, John; Fleenor, William; McElreath, Richard; Santos, Maria J.; & Moyle, Peter. (2016). Physical Controls on the Distribution of the Submersed Aquatic Weed *Egeria densa* in the Sacramento-San Joaquin Delta and Implications for Habitat Restoration. *San Francisco Estuary and Watershed Science*, 14(1). jmie_sfews_30409. Retrieved from: <http://escholarship.org/uc/item/85c9h479>
- Sutula, Martha. "Sampling the Sacramento-San Joaquin Delta Waters." *The American Biology Teacher* 38.7 (1976): 413-16. The Central Valley Regional Water Quality Control Board. The California Environmental Protection Agency. Web.
- Katharyn Boyer, and Martha Sutula. "Factors Controlling Submerged and Floating Macrophytes in the Sacramento- San Joaquin Delta." *The American Biology Teacher* 38.7 (1976): 413-16. Romberg Tiburon Center for Environmental Studies San Francisco State University. Southern California Coastal Water Research Project. Web.
- Tavechio, Washington Luiz Gomes, and Sidinei Magela Thomaz. "Effects of Light on the Growth and Photosynthesis of *Egeria Najas* Planchon." *Brazilian Archives of Biology and Technology* 46.2 (2003): n. pag. BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY. Web.
- T.K Van, T. Haller, and G. Bowes. "Effects of Light Quality on Growth and Chlorophyll Composition in *Hydrilla*." Department of Agronomy and Botany, University of Florida, Gainesville, Florida (n.d.): n. pag. Web.



Bay Honors Consortium Honors Research Symposium 2016

Sign of the Times: Symbols as Social Justice Movement Tools

An analysis of social justice iconography to determine characteristics of effective movement emblems.

Abstract

Social Justice Movements fight for equitable distribution of opportunities and privilege in society. Whether it's Kurdish independence, anti-Apartheid struggles or today's Black Lives Matter movement, these groups rely on a sense of unity. In order to build a sense of camaraderie successful movements often choose a symbol, such as the rainbow flag or the raised fist, to rally behind. What makes a symbol successful? Why do some stand the test of time, while others fade? My research explores these questions to establish guidelines for successful social justice symbols, notably those for movements centered on racial or ethnic inequalities. I demonstrate how color theory, functionality and other graphic design principles can be applied to predict which symbols attain universalized meaning and wide-spread recognition. Understanding how to design and propagate effective symbols, along with a historical understanding of common themes and images, will help new movements continue the cause of universal human rights.

Methodology

First I catalogued international social justice emblems. I noted their lifespan and pervasiveness with historical research to understand their universal appeal. Using graphic design theory I analyzed the characteristics of the most successful symbols. The work of scholar Thomas Olesen, whose research explores global injustice symbols, greatly influenced my analysis.

References

Evans, Poppy, Irina Lee, and Aaris Sherin. *The Graphic Design Reference & Specification Book*. Beverly, MA: Rockport Publishers, 2013. eBook Collection (EBSCOhost). Web. 15 Feb. 2016.

Jackson, Ben. "The Conceptual History Of Social Justice." *Political Studies Review* 3.3 (2005): 356-373. Academic Search Complete. Web. 15 Feb. 2016.

Olesen, Thomas. *Global Injustice Symbols and Social Movements*. New York: Palgrave Macmillan, 2015. Print.

Olesen, Thomas. "The Uses And Misuses Of Globalization In The Study Of Social Movements." *Social Movement Studies* 4.1 (2005): 49-63. Academic Search Complete. Web. 12 Feb. 2016.

Schnapp, Jeffrey T. *Revolutionary Tides: The Art of the Political Poster, 1914-1989*. 1st ed. Milano, Italy: Skira, 2005. Print.