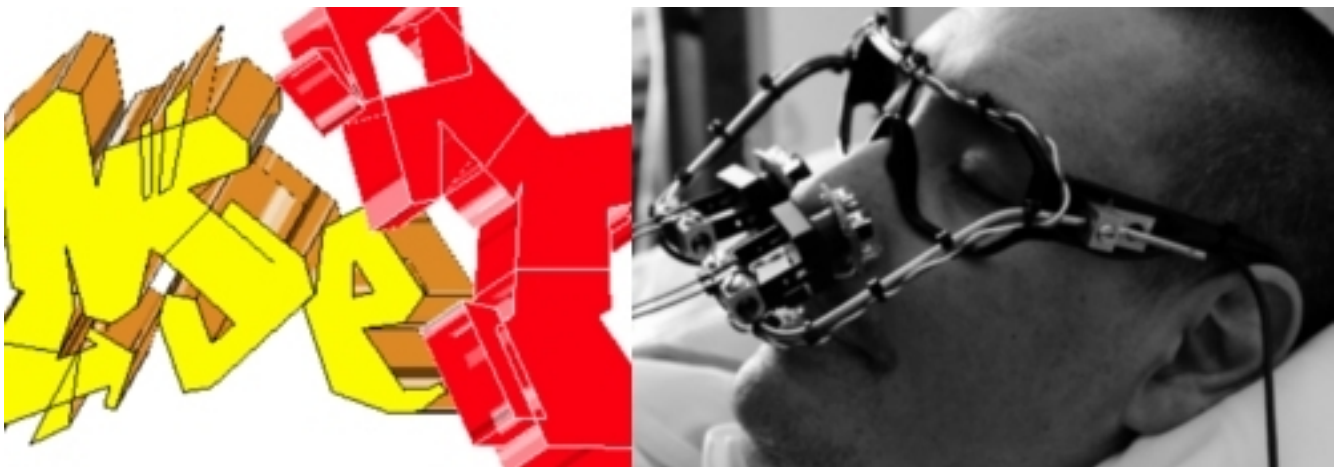




*"Art is a tool of empowerment and social change, and I consider myself blessed to be able to create and use my work to promote health reform, bring awareness about ALS and help others."*— Tony Quan

**The EyeWriter** project is an ongoing, open source, collaborative research effort to empower people who are suffering from neuromuscular disorder and injury with creative technology. The *EyeWriter* itself is a pair of low-cost eye-tracking glasses + custom software that allows artists and graffiti writers with paralysis resulting from Amyotrophic Lateral Sclerosis, as well as other neuromuscular disorders and injuries, to draw using only their eyes.

<http://www.eyewriter.org/>



(above-left: a detail from one of TEMPT ONE's "eyetags", above-right: Tony Quan wearing an early prototype of the *EyeWriter* hardware)

## The EyeWriter Story

Tony Quan, aka TEMPTONE, is a legendary LA graffiti artist, social activist and publisher internationally-known for his innovative artistic style and his efforts to build and nurture the California graffiti scene over the last three decades. In 2003, Tony was diagnosed with ALS, a degenerative neuromuscular disease, that has left him almost completely physically paralyzed. Tony is unable to move, breathe, eat or speak, but his mind and creative spirit are completely intact. And, he can still move his eyes.

In 2008, Mick and Caskey Ebeling, two Los Angeles producers, became familiar with Tony's story when they attended a fund-raising event hosted by Tony's friends, graffiti peers and family. In 2009, when Mick was presenting the work of his production company, *the Ebeling Group*, at a conference in North Carolina, he met the founders of the *Graffiti Research Lab*. The GRL is dedicated to creating open source, digital tools for graffiti writers, artists and activists and make projects that allow artists to “paint” with technology like lasers and LEDs. Mick approached the GRL, as well as members of the *Free Art and Technology Lab* (FAT) and the *OpenFrameworks* community (*OpenFrameworks* is a creative coding framework for artists in C++), with the idea of creating a tool that would enable Tony to again create art.

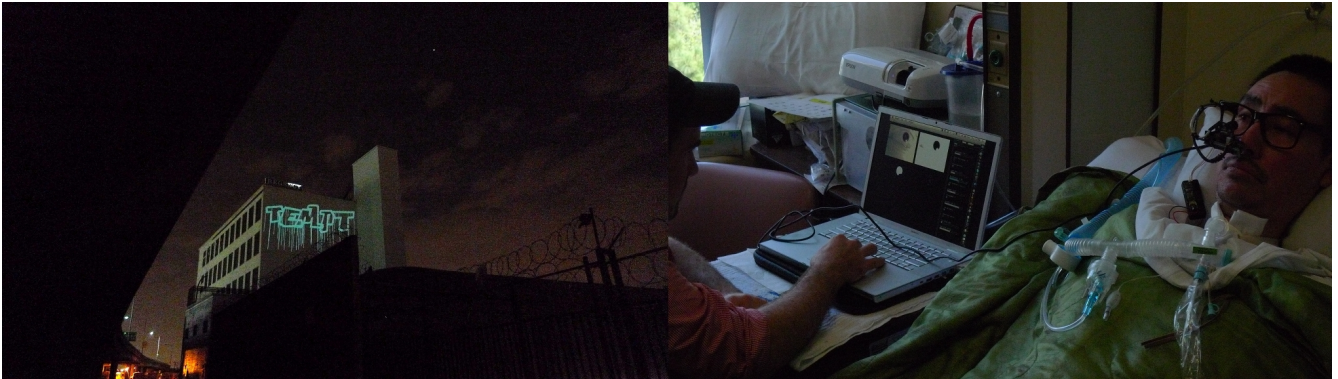
In 2009, an international team of artists and engineers traveled to LA, thanks to funding from Mick and Caskey's *Not Impossible Foundation* and *Parsons The New School for Design*, and teamed-up with Tony to create a low-cost (~\$50 US dollars), open source eye-tracking system that allows ALS patients to draw using just their eyes.



(above: Tony's artwork before ALS and Tony's work with the first prototype of the *EyeWriter*)

On August, 24<sup>th</sup>, 2009, TEMPT ONE was able to again create artwork in the streets of LA. Tony made a number of drawings in his hospital bed in Alhambra, California, using the *EyeWriter*, and transmitted them over the internet to a team of artists in downtown Los Angeles who projected his artwork in real-time onto a 10-story building beside the Santa Monica Freeway. After seven years, TEMPT was back.

*"That was the first time i've drawn anything since 2003! It feels like taking a breath after being held underwater for 5 minutes."* – Tony Quan



(above: Tony Quan & Zach Lieberman in Alhambra Hospital remotely “tagging” a site in downtown LA using the *EyeWriter*.)

The team continues to work remotely developing and exhibiting the project around the world. including: London, Canada, Norway, Korea, Yokohama, Kyoto, New York, LA, Madrid, and Amsterdam, in order to advance the technology and raise public awareness about neuromuscular disease. In January of 2010, part of the team travelled to Bombay, India in order to produce the Mumbai-version of the *EyeWriter*, in collaboration with students and professors at the *Indian Institute of Technology*. The goal of this effort was to provide one or more ALS patients in India with DIY technology that will enable them to regain control of their creative lives.

(below: TEMPTONE writing on Kyoto City Hall in Japan)





In the Spring of 2010, Zach Lieberman began teaching a class at Parson School of Design on the subject of the EyeWriter and creating interfaces for people with paralysis and spasticity to make art and communicate. The class has already produced an EyeWriter 2.0 prototype, which enables people with spasticity to be able to create art with the EyeWriter software, as well as new software applications for basic and essential computer interactions, such as controlling the mouse, writing email and surfing the web.

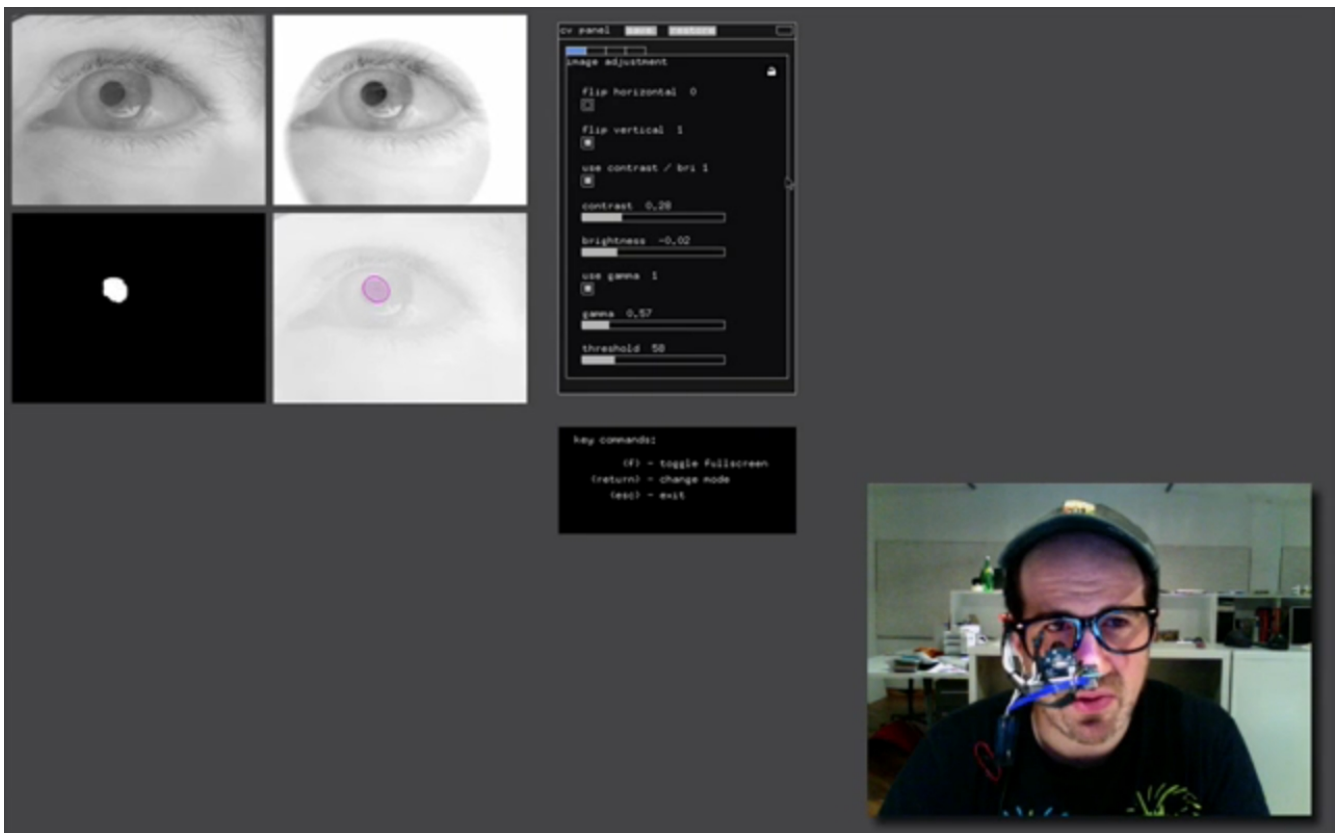
The long-term goal of the *EyeWriter* project is to continue to travel the world, including Asia, Africa, and Central and South America, exhibiting the project, hosting workshops and seeding local development in order to create a global network of software developers, hardware hackers, urban projection artists and patients who are using local materials and open source resources to creatively connect and make eye art in hopes of improving the quality of life for people suffering from serious diseases and injuries. The project has recently received the £10,000 GBP [Future Everything Award](#) that will help fund the projects long-term goals. And new, independant EyeWriter initiatives are currently starting-up all over the world, including Seoul, South Korea, at Hongik University and in India, where several small businesses have joined with students from IIT Dehli to begin producing a commercial, EyeWriter-inspired product that uses the GNU EyeWriter software and is made in India for the Indian market.



(above: The MumbaiWriter is tested on an India patient who suffers from partial paralysis in Bombay)

## The EyeWriter Hardware and Software

The *EyeWriter* software consists of three functional modules: eye-tracking, calibration and drawing. It is designed for drawing with eye movement using the *EyeWriter* eye-tracking glasses. The software for both parts has been developed using *OpenFrameworks*, a cross platform c++ library for creative development. The source code for the project is currently being hosted at: <http://code.google.com/p/eyewriter>.



(above: screenshot of the *EyeWriter* eye-tracking software walk-through tutorial)

The eye-tracking software detects and tracks the position of a pupil from an incoming camera or video image, and uses a calibration sequence to map the tracked eye/pupil coordinates to positions on a computer screen or projection. The pupil tracking relies upon a clear and dark image of the pupil. The DIY glasses we designed use near-infrared LEDs to illuminate the eye and create a dark pupil effect. This makes the pupil much more distinguishable and, thus, easier to track. The camera setting part of the software is designed so the image can be adjusted with brightness and contrast to get an optimal image of the eye.

The calibration mode displays a sequence of points on the screen and records the position of

the pupil at each point. It is designed so that a person wearing the glasses should focus on each point as it is displayed. When the sequence is finished, the two sets of data are used to interpolate where subsequent eye positions are located in relation to the screen.

(below: screenshot of the *EyeWriter* drawing software)

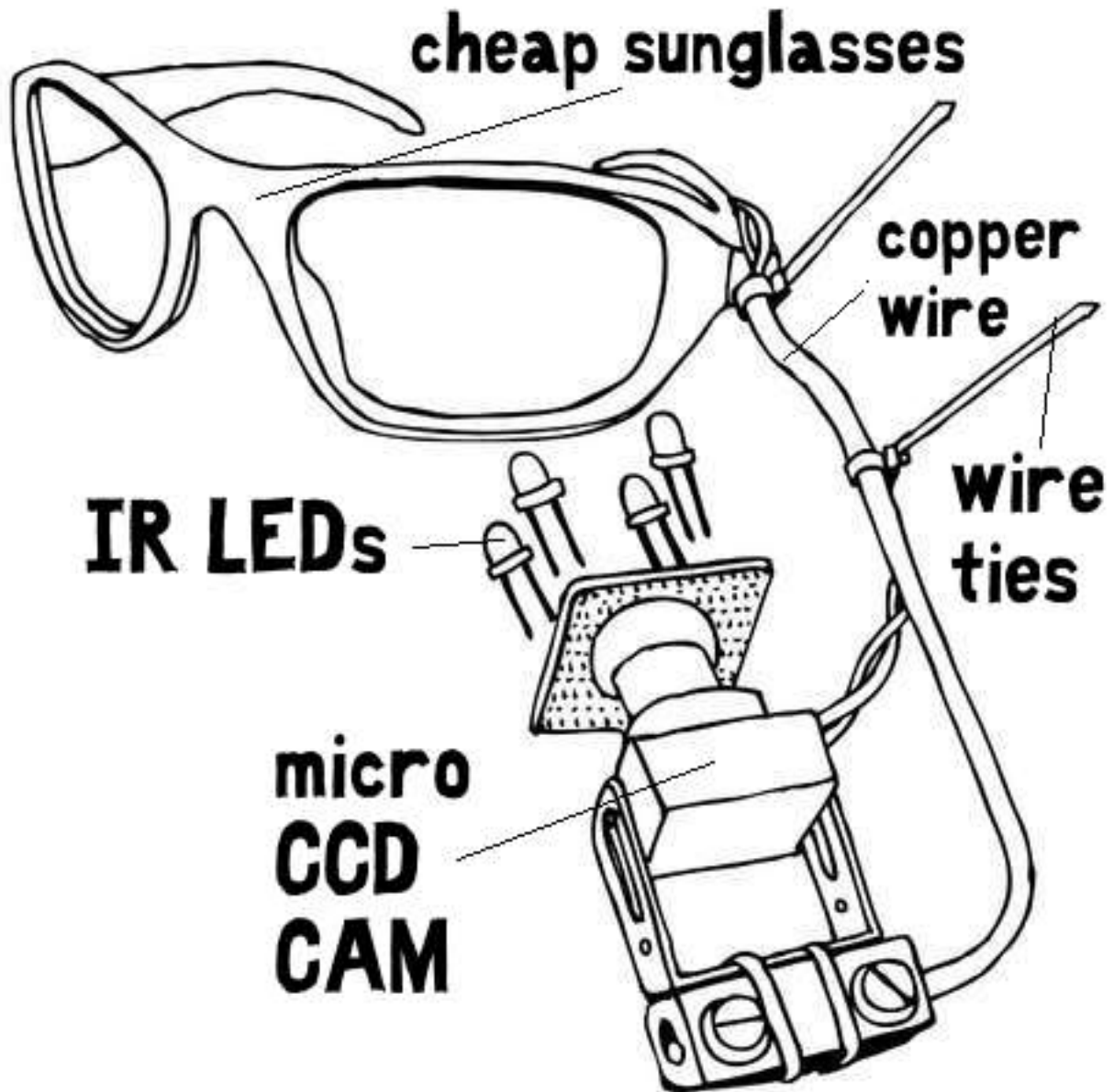


The eye-drawing software is designed to work with the *EyeWriter* hardware as well as commercial eye-trackers such as the *MyTobii*. The tool allows you to draw, manipulate and style a tag using a time-based interface so that triggering buttons or creating points for drawing is achieved by focusing on an X/Y position for a given amount of time. Tags and tag data can also be uploaded via FTP and HTTP Post and are output into a portable file format called Graffiti Markup Language. This data format can be easily transcoded into commands for automation systems, projections, new application and other computer controlled hardware and software

## Hardware

The goal of the hardware component of the *EyeWriter* project is to make the most simple and inexpensive eye-tracking headset possible to use with the *EyeWriter* software.

(below: illustration of the basic concept for the *EyeWriter* eye-tracking glasses)



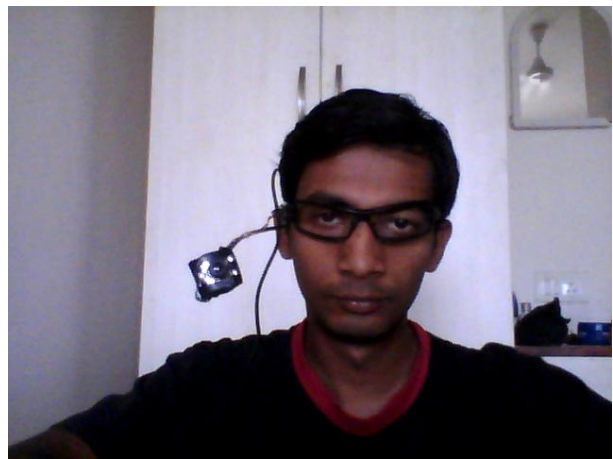
We have created a pair of solder-less eye-tracking glasses for ~ \$50 dollars using a “hacked” PS3 Eye camera, IR wratten, some aluminum wire, wire ties, IR LEDs, batteries, alligator clips and a cheap pair of sunglasses. The current design can be made using only a few basic parts, a set of small screwdrivers and a pair of scissors. Over time, the *EyeWriter* team is planning on creating a variety of eye-tracking glasses in different locations around the globe, from locally available materials, and are encouraging hackers and DIY enthusiast to make their own pair and publish instructions sets relevant to their specific locale.



We've posted a few different approaches and a great deal of information, photos and links relevant to constructing your own set of eye-tracking glasses here at Instructables: <http://www.instructables.com/id/The-EyeWriter/>.



(above-left: the *EyeWriter* glasses camera and LED mount, above-right: eye-tracking glasses made by an open source hardware developer inspired by the *EyeWriter* project; below: a version of the mumbaiwriter created by an India technology student at IIT Dehli based on the EyeWriter Initiative in Bombay, India)



## Press and Awards Related to the EyeWriter

The *EyeWriter* project was released in November of 2009 and has already received a large amount of international online, print and television media coverage, including: In the independent and on BBC2 in London, *New York Wave* on NHK in Japan, *KulturZeit* in Austria, *Esquire Magazine*, *Kyoto Shimbun* and hundreds of influential blogs, like *Boingboing.net*,



*Gizmodo, Engadget, Make Magazine, Hackaday.com* and the *Wooster Collective*. The project has received over a million visitors to the website, <http://eyewriter.org> since it was released.

<http://gizmodo.com/5345147/eyewriter-lets-you-draw-and-write-using-only-your-eyes>

<http://boingboing.net/2009/11/13/the-eyewriter.html>

<http://www.engadget.com/2009/08/26/diy-eyewriter-brings-the-joy-of-art-vandalism-to-those-with-als/>

<http://hackaday.com/2009/11/11/eyewriter-is-the-fruit-of-the-kaneye-project/>

[http://www.woostercollective.com/2009/11/eyewriter\\_source\\_code\\_released\\_to\\_the\\_public.html](http://www.woostercollective.com/2009/11/eyewriter_source_code_released_to_the_public.html)

Out of over 1000 projects submitted, The EyeWriter won the [FutureEverything Award](#) in February 2010 and will receive £10,000 GBP, which will go toward funding the next phase of EyeWriter development. In the same month, the project was nominated and won the [the Design of the Year in Interactive Art](#) from the Design Museum, London.

## Credits

The core *EyeWriter* development teams consists of members of [Free Art and Technology Lab \(FAT\)](#), [OpenFrameworks](#) and the [Graffiti Research Lab](#): [Tony Quan](#), [Chris Sugrue](#), [Zach Lieberman](#), [Theo Watson](#), [James Powderly](#) and [Evan Roth](#).

With founding support from [The Ebeling Group](#) and [the Not Impossible Foundation](#), and additional support from [Parsons Communication Design & Technology](#).

Many thanks to: [Keith Pasko](#), [LM4K](#), [Eleanor Dunk](#), [Jamie Wilkinson](#), and [Greg Leuch](#).



## Additional Project Links and More Information:

<http://www.eyewriter.org/>

*Tony's drawings using the EyeWriter:*

<http://fffff.at/tempt1/photos/eyetags/>

*The Story of the EyeWriter on <http://fffff.at/>:*

<http://fffff.at/?s=tempt1>

*EyeWriter project phase 1 trailer:*

<http://notimpossiblefoundation.com/?p=152>

*An instruction set showing where to find the parts to make the MumbaiWriter in Bombay, India:*

<http://fffff.at/how-to-build-an-eyewriter-in-mumbai-part-i/>

<http://fffff.at/fuckflickr/MumbaiWriter/>

*A short documentary film by Mark Foster about the MumbaiWriter initiative in India:*

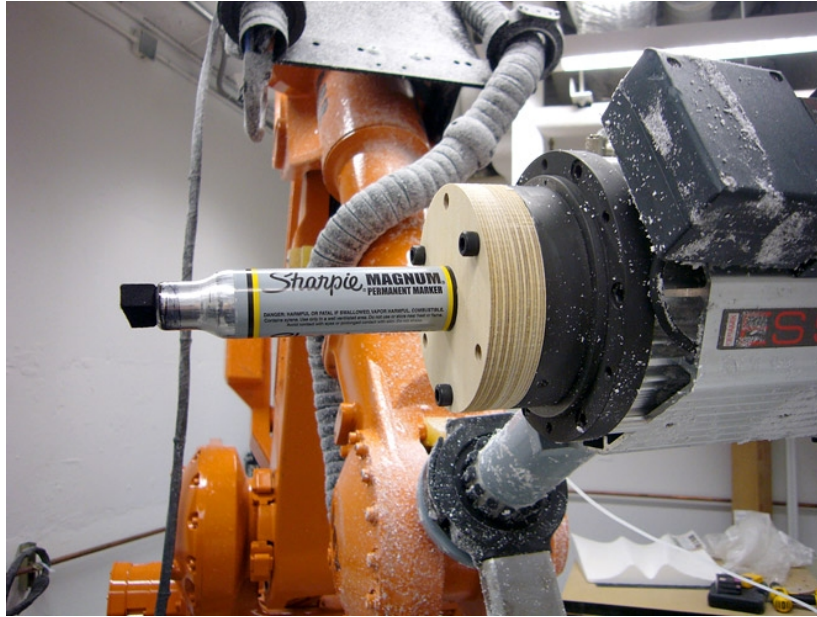
<http://www.youtube.com/watch?v=JCYwWqaxkNQ>



*(above: Student at Parsons wearing their own versions of the EyeWriter)*

*Zach Lieberman's EyeWriter class at Parsons School for Design:*

<http://collab.eyewriter.org/>



(above the robo-tagger at CMU ready to recreate TEMPT's tags using GML data)

*A Collaboration with Golan Levin at CMU, in which Tony Quan's EyeTags were transformed to automation commands for an industrial robotic arm and recreated in the lab. This was made possible by Evan Roth and Theo Watson's Graffiti Markup Language (GML). The EyeWriter software natively produced the GML file format, which allows Tony's artwork to be saved, stored online and easily transcoded to any physical or digital output system which is computer controlled.*

<http://fffff.at/gml-robotagger/>

<http://000000book.com/>



(above: the Printball after "shooting" a TEMPTONE GML tag)

*The Printball* by Benjamin Gaulon from REcyclism outputting Tony Quan's EyeWriter data, via GML, into a cholo-style TEMPT tag with a robotic paint ball gun:

<http://fffff.at/paintball-shooting-robot-writes-tempt1-tag/>

<http://www.flickr.com/photos/recyclism/sets/72157623579570602/>

<http://openframeworks.cc>

<http://fffff.at>

<http://graffitiresearchlab.com/>

<http://theebelinggroup.com>

<http://notimpossiblefoundation.com>

<http://cdt.parsons.edu/>