



The weTable:

A tool for Participatory GIS

Setup and Configuration for Tabletop Planning at Public Workshops

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Introduction

The weTable transforms an ordinary tabletop into an interactive computer interface. This affordable participation tool allows teams to collaboratively explore and use computer-based data and programs in a workshop setting. The weTable enhances what people use daily--tables and pens-- while the supporting technology works quietly in the background. This means that participants can easily use the interface with very little instruction, and it allows them to work with what matters most in a meeting--data, maps, and their fellow participants.



The weTable is an ideal tool for use in community projects where participants use data and maps to help define planning priorities and strategies. The setup is especially useful for exploring GIS data and as a participatory GIS tool. Rather than crowding around a computer screen or viewing presentations across a room, participants work together in a shared and open tabletop interface. The result is a dynamic tabletop workspace that helps participants engage the issues more meaningfully. This setup of off-the-shelf technology represents a leap in the collaborative potential of public workshops and other meetings. As advances in meeting technology continue, we can expect improvements in design and lower costs.

The use of “whiteboard” technology for participatory GIS was pioneered by Placematters, nonprofit spinoff of the Orton Family Foundation dedicated to improving decision making at the community level.

Setup and weTable Equipment

The weTable configuration works by projecting a computer screen onto a table surface. Participants interact with the table using a ‘light’ pen as one uses a computer mouse. The pen’s location on the table is detected by a Nintendo Wii remote (wiimote) that then sends a signal of the pen’s location to the laptop using a Bluetooth connection. This allows the participants at the table to control the computer, open files, move windows, and run programs by using the pen on the table. Participants can handover control of the tabletop interface to other participants as easy as handing over a marker.

To setup the weTable, it’s likely you already have the major (and costly) pieces of the equipment.

However, you will also have to acquire some additional equipment for the setup. The following items are what we found necessary to set up the weTable. Costs can vary greatly depending upon your workshop needs and ability to find deals. Any number of configurations could be made to work, and we encourage you to experiment (and to share your successes).

- Laptop (\$500-\$1,500)
- Digital Projector (\$350-\$1,400)
- Tripod (\$50-\$150)
- IR light detector with bluetooth (Nintendo Wii Remote)(\$25-\$45)
- Infrared (IR) pen (\$20-\$30)
- GPS/Phone Cradle to hold wiimote (\$25-\$35)
- Whiteboard software (\$0 - \$45)
- Plotting paper & Table Surface



Figure 1: A weTable setup- the Wiimote device is atop the projector. The image is cast onto the table.

Considerations for Equipment

Laptop. The laptop should be powerful enough to run the programs and access the data you want to use in the workshop. This includes processor speed, RAM memory, video card, and hard drive space. For the laptop to connect with the wiimote, the laptop will need a Bluetooth connection. Generally, recent laptop models come standard with Bluetooth connections. If Bluetooth is not built-in, it is possible to purchase a USB Bluetooth adapter (\$5-\$30). As with any peripheral technology, a USB Bluetooth adapter should be well tested to determine what settings work best with both the laptop and wiimote.

Projector. The projector sits atop a tripod and is aimed downward at the table surface. Most projectors have mounting holes on their underside, where the tripod shoe (quick release plate) attaches to the projector. The projector and the shoe are then clipped atop the tripod, providing a secure mount for the projector. The shoe mount and projector mounts typically have the same thread count or diameter, but this is not always the case. The angle of the projector will result in an oblique image on the table. This can be rectified by using the keystone setting on the projector, which may have to be adjusted to its maximum setting to square the image. Also, the default image will be upside down because of the projector's position at the table; this can be inverted by adjusting the image settings on the projector. These image controls are standard features on most digital projectors, but that is not always the case. Another factor to consider for small projectors is the projector's throw distance, the distance over which an image will be projected.

Micro projectors with a low lumen rating may not work reliably for the weTable. In addition, many smaller projectors will not have a threaded nut attachment for the tripod. A nut could be glued to the bottom of an otherwise acceptable project if needed, however. New computer projectors are now available that have the IR detector built in to the projector. These are marketed as "interactive" projectors. They are significantly more expensive than standard projectors, but the price is dropping.

Nintendo® Wiimote. This key piece of equipment is necessary for its optical sensor and Bluetooth connection. The wiimote is designed as a hand-held controller for the Nintendo Wii® gaming system. It is powered by two AA



Figure 1: A weTable setup- the Wiimote device is atop the projector. The image is cast onto the table.

batteries. There are several generations of wiimotes on the market, and most recent models can be counted on to connect with your laptop's Bluetooth connection. The wiimote's optical sensor is located at the front end of the device and has a field of view of approximately 45 degrees. By mounting the wiimote above the projector and facing it towards the table, you can ensure that the table image is in the optical sensor's field of view. Some wiimotes can be purchased with a removable silicone cover that provides additional grip and steadiness in the mount. There are other optical sensors on the market, including new projectors with built-in optical sensors. The new interactive projectors are



Figure 3: A participant is bringing up some data for the group to look at by using the light pen to open data layers in the computer.

at least twice the cost of a standard computer projector. The much lower cost, and the online support, availability and affordability of the wiimote makes it an easy choice for now.

GPS/Phone Cradle. A GPS/phone cradle designed for use in vehicles is used to hold the wiimote and attaches to the projector with a clamp or suction mount. Some projectors have a matte plastic surface that will not provide a clean seal for the suction clamp to work. A cradle with a flexible stem will allow you to position the cradle to fully capture the tabletop image. The cradle will have to be adjusted with each use, since the exact configuration of the projector, table, and wiimote changes with each use. Use of a cradle could be skipped by using an adhesive or velcro to affix the wiimote to the projector, although the projector body may partially obscure the wiimote's field of view. An advantage to the cradle is that it lifts the wiimote above the projector, ensuring a clear view of the table. Any number of other kinds of mounts could be experimented with, such as small "grappler" tripods. We found the best stability with the suction cap mount.

Light Pen. The light pen is a marker casing with an infrared (IR) light mounted on the pen tip. The marker houses a AA battery. A button on the side of the pen acts as a left click on the mouse- when the button is pressed, the light turns on. The human eye cannot see IR wavelengths, but you can see if your IR pen is working by observing it through a digital camera-- the light will appear pink-violet. There are several manufacturers of IR pens, most of them selling through teacher's supplies sites. Plan on at least one pen per table, plus additional pens for malfunctions and for facilitators' use. You may also try purchasing several pen designs, returning the ones that are not comfortable or practical. Also, there are online resources to assist you in making your own IR pens.



Figure 4: A closeup of a participant using a light pen to manage GIS on the weTable.

Tripod. The tripod should be sturdy and tall. The key considerations for a tripod are its height and its specification for support of weight. The specification for support of weight should be greater than the weight of the projector. A tripod with an extendible center monopod that reaches over 70 inches will provide a height that creates enough throw distance to increase the image size on the table. Because the image is projected over a distance, a small wobble on the tripod will translate into a large wobble



Figure 5: A setup of five weTables a public workshop for 35 participants.

width of the projected image. You can expect an image size between 24 and 48 inches in width. Larger sizes are possible, although pixilation becomes a noticeable issue at those sizes, depending on the projector. A single table surface is best, but sometimes the workshop room will have smaller tables; these can be pushed together, although the seam may interfere with the use of the light pen sliding across the surface. The image size can be adjusted through the projector settings or by moving the tripod backwards to increase the throw distance. There have been some issues with the type of ambient light, where halogen lights can interfere with the wiimote's ability to detect the light pen. The table surface should be overlain with 36inch width or greater white plotting paper or butcher paper. This will ensure a clean, sharp image that is true to the image color. Glossy or waxed paper has the potential to interfere with the light pen. Affix the paper to the table with masking or scotch tape; duct tape should be avoided because it will cling to participants' clothes and skin, peeling back the paper from the table.

Configuring the table

1. Set up the table. A long table surface is ideal for a weTable setup. The projector and tripod are positioned at one end of the table, while the paper, image, and participants are positioned at the opposite end of the table. The power and data cables can be tripping hazard, and they should be duct taped to the floor. Signage or cones should be placed around the tripod and projector to keep participants from accidentally knocking the system, since any nudge to the table or tripod will require a recalibration of the image (see below).

2. Connect the Wiimote and laptop.

First, use the laptop's Bluetooth connection to identify the availability of the wiimote. Access your laptop's Bluetooth settings to prompt the laptop to search for nearby Bluetooth devices. In order to detect the wiimote, the wiimote must send out a signal, which is done by pressing simultaneously the wiimote's A and B buttons. The laptop will detect the wiimote signal as a 'human interactive device' (HID) and may display the wiimote's unique device code. Once the wiimote is detected, you must then activate the

in the projected image. This is worsened by the weight of the projector atop a fully extended tripod. A low quality tripod might appeal to your budget, but it is guaranteed to worsen the wobble. A wobbly image strains the eye and detracts from the workshop. This makes sturdiness in tripod construction a key consideration in purchasing and using a tripod. There is a range of tripods on the market, where price is a strong indicator of quality.

Table surface and room. The table surface should be wide enough to capture the full



Figure 6: Several light pens can be used at the same table, but only one at a time can control the laptop.

Bluetooth connection. Some Bluetooth connections require a pin number to fully activate the connection. The wiimote has no pin (0000) and is unnecessary to enter. In a workshop setting, you are likely to have several weTables operating. To ensure that you are connecting to the correct device at the table, the unique device code becomes important to distinguish the correct device from others. It will be helpful in this case to label both wiimotes and laptops to keep paired devices together.

3. *Calibrate the wiimote and light pen.* Once the wiimote is connected, run a whiteboard software program.

'Whiteboard technology' refers to a variety of small software packages that allow users to turn any screen surface into an interactive whiteboard. There are several of these programs on the market- some are open source programs, others are proprietary. We recommend using a licensed version with support documentation. After opening the program, select the option to calibrate the table ('whiteboard') surface. At this point, the software will project four calibration points on the table surface to help the computer determine the image perimeter. Use the light pen to touch each calibration point. If the touch points are outside the wiimote's field of view, the computer will not be able to detect that portion of the table. In this case, you will need to adjust the wiimote and cradle to ensure that the entire image is captured in the wiimote's field of view, and then re-run the calibration. When the points have been calibrated, the computer is able to identify the light pen's location on the image. Now, the light pen can be used to directly control the laptop. If the table, tripod, or projector have been nudged or otherwise shifted, the table will have to be recalibrated.

4. *Run and use laptop programs.* Once the wiimote is connected and the table surface calibrated, you can run your computer programs for the workshop using the weTable and controlling them with the light pen. Sequence matters for setting up the weTable. The light pen will only control programs initiated after the table has been calibrated. This involves default security settings in Windows that prevent third-parties and remote controlling from accessing certain features in the operating system. If the table has to be recalibrated, simply minimize the open programs and use the whiteboard software to recalibrate the table.

Special thanks to Placeways and Placematters for ideas and guidance on use of the interactive whiteboard technology.



Figure 7: a closeup of a light pen on the weTable. In this image, GIS is running and viewable on the table.

Online resources for setting up and configuring the weTable

The technology is changing rapidly. These web links may be out of date by the time you read this. The sites below are for inexpensive interactive whiteboard applications. A high-tech equivalent of the “weTable” style white board, for example, can be purchased for just under \$10,000.

Use of the weTable at a workshop in Texas and some step by step instructions:

<http://www.youtube.com/user/TXCWatershedProgram#p/a/u/0/pjZd0BoPwGg>

The original Johnny Chung Lee Wiimote whiteboard descriptions:

<http://johnnylee.net/projects/wii/>

<http://www.youtube.com/watch?v=5s5EvhHy7eQ>

Infrared Pens:

<http://shop.irpensonline.com/>

Teacher sites for interactive whiteboards:

<http://www.wiimoteproject.com/index.php>

<http://teachwithtech.com/Wiimote-Whiteboard-Mobile-Presenter-Pack-p27.html>

<http://www.edgalaxy.com/journal/tag/iwb>

More wiimote mounts:

<http://www.wiimoteproject.com/index.php>

IWB supplies

http://penteractive.us/main/?page_id=58#ecwid:category=323292&mode=category&offset=0&sort=normal

The tripod we selected

http://www.bhphotovideo.com/c/product/517982-REG/Sunpak_620_757TM_Ultra_757TM_Tripod_Monopod_with.html

The wiimote mount we selected—needs a slick or glossy surface to work:

<http://www.verizonwireless.com/b2c/store/accessory?action=refineByCategory&categoryId=20>

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