Thermal Cameras

http://en.wikipedia.org/wiki/Thermographic_camera

These cameras are comparatively rare to see in use in interactive installations because they are still prohibitively expensive compared to most other ones. They aren't totally unobtainable (roughly 1000-20000USD) but that higher price tag makes them a little less desirable for early exploration on projects. It's a shame because these cameras offer a lot of abilities that just aren't possible with the other kinds of cameras.

There are various types of cameras to look at in this class, mostly pertaining to which part of the IR spectrum you're trying to see. You have the option of Long Wave IR, Mid Wave IR, and Short Wave IR. For thermal imaging, you'll mostly want to work with Long Wave IR, in the 7000-14000nm range.

I have not personally used one of these cameras yet, but they have some properties that would be really amazing in the tool belt of people making interactive installations.

Check out this guy doing some random demos with a thermal camera:

Connection types: Most are made to be integrated into existing systems and either have proprietary connections or just output composite video. Some cameras communicate X/Y position of blobs.

Resolution range: Some are very low resolution (the Thermitrack is 16 x 16px) and some are close to a VGA range, but don't expect to find HD thermal for cheap. You also get a variety of frame rates and contrast ranges.

Thermal Camera Pros:

- Normal visible light doesn't have much of an effect on a thermal camera.
- Good for tracking a large area like a stage.
- Gives you the ability to more definitely identify people because of their heat signature...whereas other objects and materials may not show up at all if they are warmer.
- Fairly robust for daytime to night time interaction because people will be the same temperature and appear in the proper dynamic range.
- Give you the ability to track invisible phenomena like hot air from breath, or residual heat from something like a hand leaving a warm mark on a surface, or a cold blast of water hitting a warm surface.
- Can see through certain materials and walls.
- Thermal cameras can see through certain kinds of clothing.

Thermal Camera Cons:

- As these are occasionally considered military grade equipment, there may be export restrictions, so be wary when planning on traveling abroad.
- Expensive
- Difficult to integrate - require either custom electronics or capture hardware
- Thermal cameras can see through certain kinds of clothing.
- Not all lights are invisible to thermal cameras...if it's producing heat or radiating it, the camera will see it.
- Thermal imaging sometimes results in ghosting of movement due to the sensor method.
- They are unable to see through windows/glass because the range of radiation ends up being reflected before it transmits through the glass to the camera. See here for a more involved explanation of why.
- Certain hot materials may result in unforeseen difficulties with using thermal imaging in certain environments. Requires a different type of thinking in order to anticipate things that will be overly hot or cold in the space of the installation.

Further reading:

People counters (wiki)"

Thermitrack

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