AUDIO TOUCHSCREEN

BACKGROUND

[0001] The present invention relates generally to the field of touchscreen user input devices for computers ("touchscreens"), and more particularly to touchscreens that use audio input data ("audio touchscreens").

[0002] In some audio touchscreens, user input signals are generated by sound-to-signal transducers (herein called "microphones") in response to a physical tap or sound-producing physical interaction (herein sometimes called a "sonic event") against a surface (herein called an "audio touchscreen" or a "virtual touchscreen"). These user input signals are processed to determine the location, on the audio touchscreen, of the origination of the sound. Because the sound source can be located with respect to the audio touchscreen, different locations on the audio touchscreen can be used to receive different user input. A simple example of this is when the audio touchscreen is divided into areas corresponding to keys on a keyboard, and the user taps the "keys" on the audio touchscreen to enter user input in the form of alphanumeric characters.

[0003] Wikipedia (http://en.wikipedia.org/wiki/Wireless_ad_hoc_network, as of 11 Jun. 2015) discloses as follows: "A wireless ad hoc network (WANET) is a decentralized type of wireless network. The network is ad hoc because it does not rely on a pre-existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, so the determination of which nodes forward data is made dynamically on the basis of network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding data . . . . Wireless mobile ad hoc networks are self-configuring, dynamic networks in which nodes are free to move."

SUMMARY

[0004] According to an aspect of the present invention, there is a method, computer program product and/or system that performs the following steps (not necessarily in the following order): (i) receiving, by a set of processor(s), microphone location data respectively corresponding to locations of a plurality of microphones including at least a first microphone, a second microphone and a third microphone; (ii) receiving, by the set of processor(s), a plurality of sonic signals corresponding to a sonic event respectively transduced by each microphone of the plurality of microphones, where each sonic signal includes time data providing a time of the corresponding sonic event; (iii) triangulating, by the set of processor(s), to determine a location of a source of the sonic event based, at least in part, on the plurality of sonic signals and the microphone location data; and (iv) generating, by the set of processor(s), a user input data based at least in part on the location of the sonic event as determined by the triangulation. The first computer device is operatively coupled with the first microphone. The first sonic signal is received from a first computer device. The second computer device is operatively coupled with the second microphone. The second sonic signal is received from the second computer device which is different than the first computer device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. **1**A is a block diagram view of a first embodiment of a system according to the present invention;

[0006] FIG. **1**B shows external devices **214** of FIG. **1**A in a first embodiment of a system according to the present invention;

[0007] FIG. **2** is a flowchart showing a first embodiment method performed, at least in part, by the first embodiment system;

[0008] FIG. **3** is a block diagram showing a machine logic (for example, software) portion of the first embodiment system;

[0009] FIG. **4** is a screenshot view generated by the first embodiment system; and

[0010] FIG. **5** is a sound signal diagram in a second embodiment of a system according to the present invention.

DETAILED DESCRIPTION

[0011] Some embodiments of the present invention are directed to audio touchscreen systems with one or more of the following features: (i) audio information for locating tap sounds is provided by more than one microphone-including computer device (for example, a set of multiple smartphones and laptops each with its own microphone); (ii) the multiple microphone-including computer devices can be placed (for example, smart phones placed at the corners of a conference room table), moved and/or removed from the system independently of each other and/or independently of the location of the audio touchscreen surface; and/or (iii) an ad hoc network (sometimes called WANET) is used to communicate at least some of the audio information from the multiple microphone-including devices to a computer that performs the triangulation calculations to locate the locations of the audio touchscreen tap sounds in space.

[0012] This Detailed Description section is divided into the following sub-sections: (i) The Hardware and Software Environment; (ii) Example Embodiment; (iii) Further Comments and/or Embodiments; and (iv) Definitions.

I. The Hardware and Software Environment

[0013] The present invention may be a system, a method, and/or a computer program product. The computer program product may include a computer readable storage medium (or media) having computer readable program instructions thereon for causing a processor to carry out aspects of the present invention.

[0014] The computer readable storage medium can be a tangible device that can retain and store instructions for use by an instruction execution device. The computer readable storage medium may be, for example, but is not limited to, an electronic storage device, a magnetic storage device, an optical storage device, an electromagnetic storage device, a semiconductor storage device, or any suitable combination of the foregoing. A non-exhaustive list of more specific examples of the computer readable storage medium includes the following: a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), a static random access memory (SRAM), a portable compact disc read-only memory (CD-ROM), a digital versatile disk (DVD), a memory stick, a floppy disk, a mechanically encoded device such as punch-cards or raised structures in a groove having instructions