MOBILE CRANE ACCESSORY
CONTROL EXAMPLE

GRAPHICAL BUTTONS
FOR TOUCH SCREEN

ABSTRACT

An apparatus for use in controlling model train layouts. The apparatus includes a handheld computer having at least one communications port disposed thereon. A custom software program is disposed within such handheld computer for generating and communicating control signals to a model train layout. An electronic interface communicates the control signals generated between such handheld computer and such model train layout.
MOBILE CRANE ACCESSORY
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FIG. 1
GRAPHICAL LOCOMOTIVE CONSISTING EXAMPLE

GRAPHICAL SCROLL BAR FOR VIEWING MORE INFORMATION THAN WILL FIT ON THE SCREEN

GRAPHICAL BUTTONS FOR TOUCH SCREEN CONTROL

FIG. 2
GRAPHICAL LOCOMOTIVE CONTROL EXAMPLE

LOCOMOTIVE SELECTION WINDOW

GRAPHICAL SLIDER CONTROL FOR SPEED

DIRECTION CONTROL BUTTONS

HEADLIGHT CONTROL BUTTONS

HEAD LIGHT ON OFF FWD REV 50%

NUMERICAL SPEED DISPLAY

FIG. 3
THROTTLE
FORWARD / REVERSE
DIRECTION SWITCH

SPEED CONTROL KNOB

INDICATOR LEDS
FUNCTION BUTTONS
EMERGENCY STOP BUTTON

LOCOMOTIVE ADDRESS SELECTOR

FIG. 4
MINIMUM SYSTEM TO CONTROL DCC

FIG. 7
THROTTLE

PUSH BUTTON / KNOB COMBINATION CONTROL

CUSTOM 2-LINE TEXT DISPLAY

FUNCTION CONTROL BUTTONS

FIG. 9
METHOD OF AND AN APPARATUS FOR USING A
GRAPHICAL HANDHELD COMPUTER FOR
MODEL RAILROAD PROGRAMMING AND
CONTROL.

CROSS-REFERENCE TO RELATED
APPLICATIONS

[0001] This application claims priority from my earlier filed provisional application Serial No. 60/309,071 filed Jul. 31, 2001.

FIELD OF THE INVENTION

[0002] This invention relates, in general, to model railroading and, more particularly, this invention relates to a method of and an apparatus which enables controlling a predetermined number of model trains operating on a track system using a graphical handheld computer for the selection and control of such model trains.

BACKGROUND OF THE INVENTION

[0003] The model train industry, as is generally well recognized in the art, has always sought additional ways to make model trains run more realistically like real trains. Before digitally controlled trains, there were a number of limitations on the way the engine could run. For example, two trains on the same electrically connected track had to run in the same direction, as well as, at the same speed.

On the other hand, with Digitally Controlled Trains (DCT) each train engine is equipped with a decoder, which decodes electrical messages sent over the track feed. This allows the engine to be individually controlled. Individual control provides the train operator with more realistic train operation. With digital control, a train may be driven in the same direction, the speed, or accessories on one engine. Also, the user could use their control to release one engine and acquire control of another.

[0005] The widely accepted standard for controlling model trains was generated by the NMRA (National Model Railroad Association). The standard for DCC (Digital Command Control). This standard spells out the electrical signal specification and software protocols, which vendors of DCC equipment should comply to in order that many vendors can build model train equipment, which is compatible with other DCC systems. To date, several vendors manufacture decoders for engines, power units that drive the DCC signal onto the track feed, and throttles, which are used to control the engines.

[0006] Prior to the present invention, the throttles available have control knobs and may have a line or two of text, which is used to program or control the engines, or accessories. A typical scenario of controlling an engine with one of these controllers is as follows. First, the operator must know the address of the locomotive (Model Train Engine). The operator then enter the address into the throttle, sometimes by using rotary knobs or other type of controls. Then the user must acquire the Loco. The typical controller has a knob to control the locomotive speed, and a toggle switch, which is used to choose the locomotive’s direction. At this point the operator must rotate the throttle knob to the position which corresponds to the present locomotive’s velocity, to finish acquiring the Loco. Furthermore, the operator must have had the direction switch (forward/reverse) in the proper position, which represents the direction the Loco is presently traveling. Now the operator can adjust the speed of the engine. The typical throttle has function keys or buttons, which can be used to activate locomotive accessories like the engine lights or sounds.

SUMMARY OF THE INVENTION

[0007] Becoming more popular, at the present time, and lower in cost are Pocket Computers or PDA’s. Some examples of available Pocket Computers are the Palm, Visor, HP Jornada, Casio Cassiopeia, etc. These Pocket Computers all have in common powerful CPUs, the ability to have new software programs readily installed on them (to increase their capabilities), touch screens, pixel capable graphic screens, have one or more communication ports, are portable, and have large amounts of memory for programs and data.

OBJECTS OF THE INVENTION

[0008] The present invention provides an apparatus for use in controlling model train layouts. This apparatus includes a handheld computer having at least one communications port disposed thereon. A custom software program is disposed within such handheld computer for generating and communicating control signals to a model train layout and an electronic interface is provided for communicating control signals generated between such handheld computer and such model train layout.

[0009] It is, therefore, one of the primary objects of the present invention to provide an apparatus and method for use with a graphical handheld computer to enable an operator to simultaneously control a plurality of trains of a model railroad.

[0010] Another object of the present invention is to provide an apparatus and method for use with a graphical handheld computer which will give the operator of the model railroad the capability of operating such railroad in a manner substantially similar to the operation of a real railroad.

[0011] Still another object of the present invention is to provide an apparatus and method for use with a graphical handheld computer to control model train layouts through a communications port with an electronic interface and custom software.

[0012] A further object of the present invention is to provide an apparatus and method for use with a graphical handheld computer which will make controlling locomotives and accessories easier and quicker by equipping such graphical handheld computer with a touch sensitive graphic capable screen.

[0013] Yet another object of the present invention is to provide an apparatus and method for use with a graphical handheld computer which will enable the operator to control a model train layout using hard wired, RF, inferred, or other types of communications to control such model train layout.

[0014] In addition to the various objects and advantages of the present invention which have been described in some detail above, it should be noted that various other objects
and advantages of the instant invention will become more readily apparent to those persons who are skilled in the relevant art from the following more detailed description of such invention, particularly, when such description is taken in conjunction with the attached drawing figures and with the appended claims.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**[0015]** FIG. 1 is a schematic illustration of a mobile crane accessory control example according to one embodiment of the present invention.

**[0016]** FIG. 2 is a schematic illustration of a graphical locomotive control example according to an embodiment of the present invention.

**[0017]** FIG. 3 is a schematic illustration of a graphical locomotive control example with a locomotive selection window according to an embodiment of the present invention.

**[0018]** FIG. 4 is a schematic illustration of a throttle with a forward/reverse direction switch according to an embodiment of the present invention.

**[0019]** FIG. 5 is a schematic illustration of the hand held computer hardware used in the present invention.

**[0020]** FIG. 6 is a schematic illustration of one example of a presently preferred embodiment of the present invention.

**[0021]** FIG. 7 is a schematic illustration of an alternate embodiment of the present invention.

**[0022]** FIG. 8 is an illustration of a hand held computer which can be used in the present invention.

**[0023]** FIG. 9 is an illustration of a throttle with a push button/knob combination control according to an embodiment of the present invention.

**[0024]** FIG. 10 is an illustration of a computer having an added control feature which can be used in the present invention.

**[0025]** FIG. 11 is a pictorial view of the hand held computer hardware according to an embodiment of the present invention.

**[0026]** FIG. 12 is a pictorial view of an alternative hand held computer which can be used in the present invention.

**[0027]** FIG. 13 is a pictorial view of a model train layout which can be controlled according to the instant invention.

**[0028]** FIG. 14 is a pictorial view of another alternative embodiment of a hand held computer which can be used according to an embodiment of the present invention.

**[0029]** FIG. 15 is a pictorial view of another model train layout which can be controlled according to the present invention.

**[0030]** FIG. 16 is a pictorial view of another locomotive which can be controlled with the present invention.

**[0031]** FIG. 17 is a schematic diagram according to a presently preferred embodiment of the invention showing a complete system.

**BRIEF DESCRIPTION OF A PRESENTLY PREFERRED AND VARIOUS ALTERNATIVE EMBODIMENTS OF THE INVENTION**

**[0032]** Prior to proceeding to more detailed description of the present invention is should be noted that identical components which have identical functions have been identified with identical reference numerals throughout the several views illustrated in the drawings for the sake of clarity and understanding of the invention.

**[0033]** Reference is now made, more particularly, to FIGS. 1-17 of the drawings. Illustrated therein, for example, is a graphical handheld computer, generally designated 10, for model railroad programming and control. Such graphical handheld computer 10 includes software programmed therein and an electrical interface 12 (FIGS. 10) for one of the several Pocket PC's (PDA's) presently available on the market.

**[0034]** The software developed for the Pocket PC would preferably be programmed in C or C++ language. This would allow the programmer to have the best ability to create portable code. Portable code would be code which could be compiled on one compiler, like Code Warrior, to be used on the Palm device, or with only slight modification could be compiled with Microsoft Windows CE embedded visual tools if it were to execute on the HP Jornada, Casio Cassiopeia, etc. The software for these devices could, for example, be supplied on disquette. The user would typically connect his Pocket PC to a desktop PC with a communications cable (not shown). The user would run an application, which could automatically load the contents of the software disquette first to the desktop PC and then to the Pocket PC. An alternate method of installing software on the Pocket PC would be to load a desktop PC with the software via the internet and then load the software through the Pocket PC's communication cable. Yet, another alternative would be to supply the software program on a permanent memory device such as a flash disk, Compact FLASH, etc., which would be compatible with the particular Pocket PC. The method of supplying the software on a permanent memory device like Compact FLASH would eliminate the requirement for a desktop PC and would be the simplest method of software installation.

**[0035]** One possible use for the Pocket PC with the proper electrical interface is shown in figure x. This figure shows how the Pocket PC could be used to program DCC decoders. In this example the Pocket PC would use a RS232 serial interface to communicate with the microcontroller. Since the RS232 serial port most Pocket PCs are equipped with, do not have acceptable timing or voltage levels to program DCC, the interface electronics would be required to translate the timing and voltages to the proper levels. One method of accomplishing such a task would be to convert the +/-12 Volt RS232 levels to zero to five volt levels, which a microcontroller could receive and transmit. The code in the microcontroller could generate timing required by the DCC specification. Furthermore, the output of the microcontroller would have to go to more electronics so its zero to five volt signals coming from the microcontroller could be converted to the proper DCC levels.

**[0036]** One such system which has throttles networked together is produced by Digitrax. Digitrax builds a system in which multiple throttles talk on a pier-to-pier network that
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has a communication protocol similar to Ethernet. Digitrax calls this network LocoNet. The Pocket PC could have an interface to such a network and be used as a throttle with other Digitrax throttles. A block diagram of such an interface is shown in FIG. 10. In this example the Pocket PC would use a RS232 serial interface to communicate on the LocoNet network. Since the RS232 serial port most Pocket PCs are equipped with, do not have acceptable timing or voltage levels for LocoNet interface electronics would be required to translate the timing and voltages to the proper levels. One method of accomplishing such a task would be to convert the +/-12 Volt RS232 levels to zero to five-volt levels, which a microcontroller could receive and transmit. The code in the microcontroller could generate any timing required by LocoNet. Furthermore, the output of the microcontroller would have to go to more electronics so its zero to five volt signals could be converted to the proper LocoNet levels. The final electronics would probably be open collector transistors because this is a requirement of the LocoNet specification.

[0037] Another possible application for the Pocket PC is a controller also shown in FIG. 10. In this example the RS232 serial port would connect to a DCC controller box. The controller box would receive the serial commands to control DCC equipment. A microcontroller in the controller box would keep track of the Locos running and generate the required refresh signals, which would be sent to the section of train track. The microcontroller would also monitor the serial port the Pocket PC is connected to for new throttle or accessory commands. Because Model Railroad track is exposed metal, short circuits are likely. Therefore, there would be a necessity for the controller to have short circuit protection built in.

[0038] The features Handheld PCs come with can be very beneficial to the Model Railroader like Touch Screen, possible Color Graphics, communications port, etc. and can be used to control engines or accessories. Accessories could include but not be limited to turn outs (switch tracks), Crane (mobile or stationary), Coal (bulk commodity) handling facilities, block signals, lighted accessories, sound devices, crossing gates etc.

[0039] One feature, which could make the Pocket PCs even more desirable for a Digital Model Train Throttle is the addition of a speed control knob 14. An example of such a knob 14 added onto the Pocket PC is shown in FIG. 10. Preferably the knob 14 would be of the continually rotating type, which produces electrical pulses proportional to the amount of rotation. A microcontroller in the base unit would count the pulses from the knob 14 and convert them into change in position numbers and transmit the numbers back to the Pocket PC via a communication port. A continuously rotary knob 14 would be preferred because if the user was controlling one engine which the user intends to leave running and acquires another engine which is running at full speed, it would not be necessary to turn the knob to some predetermined position for speed matching before control of the locomotive was allowed.

[0040] Because existing controllers have only Knobs, Pushbuttons, Lights and simple text displays it is difficult to use such equipment to control the Digitally controlled engines. As the Graphical User Interface (GUI) has made Personal Computers (PC's) easier to use, the Pocket Computer's GUI will make using digitally controlled model train equipment easy also. The Pocket Computer can be programmed with custom software, written for the model train user, and custom electrical interfaces can be built, so that communication ports can be used to control the Digital Trains.

[0041] A Pocket Computer with interfacing electronics, and custom software developed specifically for Model Train Control offers a much improved throttle and accessory control device as compared to existing controllers. The touch screen and graphics capabilities of the Pocket Computers make presently difficult tasks such as selecting a locomotive to control, simple and quick. One such example of using the Pocket PC for a throttle is as follows. Locomotives to be controlled are displayed graphically on the screen. The graphics can be iconic or picture like. The touch screen makes acquiring a locomotive as simple as touching the icon or picture of the engine the user would like to control. The Pocket PC can be programmed to automatically send the appropriate signals to release the presently acquired locomotive if desired, and in its memory it can remember the locomotive’s speed and direction, which the user is trying to select. Therefore, the Pocket PC can automatically set an indicator to the new locomotive speed and also, set the direction indicator appropriately too. This type of throttle can be much simpler and quicker to use than existing throttles. The entire process to acquire a locomotive can be reduced to touching the appropriate position on the Pocket PCs touch screen once. Furthermore, the screen can be programmed with useful text to indicate functionality to the user. For instance, two buttons on the touch screen could be labeled Lights On and Lights Off. By simply touching either button the lights could be turned on or off.

[0042] In addition to controlling the locomotives, the Pocket PC can be equally useful to control accessories. One such accessory could be a digitally controlled motorized crane FIG. 1. A model railroad crane may have three or more axis that can be controlled. If pictures of the crane’s controllable axes are shown on the Pocket PC’s display, graphical buttons on the touch screen can be used to easily control the cranes movement.

[0043] Because the Pocket PCs are programmable computers they can be used to add realism to a model train layout by keeping track of things like fuel consumption. Since the Pocket PC is commanding the locomotives speed, the Pocket PC can make a fuel consumption calculation and display remaining fuel. If the Loco being controlled was a Steam Engine the Pocket PC can display coal and water levels.

[0044] A complete system could be built with the handheld computer as a throttle that is shown in FIG. 17. In this configuration a PC or Embedded PC could be used as a DCC Master. In this configuration the handheld computers would communicate with the DCC Master via a wireless network (such as wireless Ethernet IEEE specification 802.11 b) and the DCC Master would receive signals from one or more handheld computers and create the DCC signal required to run DCC locomotives and accessories.
To follow is a comparison of operation between known devices and the apparatus of the present invention.

Existing Devices

Select a locomotive to control with a DigiTrax UT2 throttle.

1. Release control of one locomotive (Dispatch a locomotive) to select a different locomotive by pressing shift button simultaneously with the dispatch button.

2. Rotate two dials to an address of a locomotive. Note: you must remember the address programmed into each engine you would like to control.

3. Press the Acquire button.

4. If the Speed and/or the direction controls are not in the proper position (the position such that the locomotive being acquired has the same speed and direction), then they must first be set in the proper positions.

5. Now the user can change the speed and direction or operate the controls

6. Try to remember which function keys F1, F2 etc. control which locomotive, functions such as Bell, Horn, Headlight Dimmer, Dynamic Break Sound etc.

7. To activate functions greater than F2 (i.e. F3) two keys must be pressed simultaneously.

Other Presently Known More Advanced Devices

1. Release control of selected locomotive???

2. Key in address of the locomotive to control By using a 10 digit keypad and pressing an enter key. Note: you must remember the address programmed into each engine you would like to control Note: usually the address is four digits so this requires five keystrokes.

3. Adjust the direction???

4. Now the user can change the speed and direction or operate the controls

5. Try to remember which function keys F1, F2 etc. control which locomotive functions such as Bell, Horn, Headlight Dimmer, Dynamic Break Sound etc.

With The Present Invention

1. Press the location on the screen to select a locomotive.

2. Press the picture of the locomotive to be controlled. Note: If a locomotive was already being controlled the invention software will automatically dispatch the locomotive and acquire the newly selected locomotive. Note: no matter how many address digits are used this procedure usually only requires two press on the touch screen.

3. The screen will only display the proper number of buttons, labeled in English (or any other language), to control the installed features of the newly selected locomotive. Note: for each new locomotive added to apparatus of the invention a single, one time only configuration would need to be completed.

1. Select a picture from a list of available locomotives.

2. Enter any locomotive name (usually Road Name and cab number i.e. NS1234)

3. Enter locomotive address. Note: you only need to know the locomotive address once. The Pocket PC will remember the address and relate it to the locomotive picture.

4. Define the function buttons by entering a name for the function and the proper DCC signal to activate for that function. Note: the operator only needs to know the functions and related DCC signals at this time.

It is possible to automate the task of configuring a locomotive as described above. If the locomotive came with a picture and function button information in a computer type format, then the configuration could be automated. Example: by simply making a connection from the locomotive or accessory to the handheld PC, the configuration could take place programmatically.

While a presently preferred embodiment as well as a number of alternative embodiments of the present invention have been described in considerable detail above it should be obvious that various other modifications and adaptations of the instant invention can be made by those persons skilled in the relevant model railroading art without departing from either the spirit of the invention or the scope of the appended claims.

I claim:

1. An apparatus for use in controlling model train layouts, said apparatus comprising:
   (a) a handheld computer, said computer having at least one communications port disposed thereon;
   (b) a custom software program disposed within said handheld computer for communicating control signals to a model train layout; and
   (c) an electronic interface for communicating said control signals between said handheld computer and said model train layout.

2. An apparatus, according to claim 1, wherein said handheld computer includes a touch sensitive screen.

3. An apparatus, according to claim 2 wherein said handheld computer includes a screen capable of displaying graphics.

4. An apparatus, according to claim 1, wherein said apparatus further includes a speed control knob.

5. An apparatus, according to claim 1, wherein said apparatus further includes a throttle control knob.

6. An apparatus, according to claim 1, wherein said handheld computer further includes a help button.

7. An apparatus, according to claim 1, wherein said model train layout is controlled by at least one of hardwired, RF, infrared and other known types of communications.

8. An apparatus, according to claim 7, wherein said model train layout is controlled by hardwired communications.

9. An apparatus, according to claim 3, wherein said graphics are displayed in color.

10. An apparatus, according to claim 1, wherein up to 30 units can be controlled simultaneously with said apparatus.