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Smart TV Pairing Interface Using Smart Phone

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Abstract

A way to pair a controller to a user device, for example pairing a smart phone to a smart TV to control the smart TV, is described. The user device is pre-programed to interpret a chirp packet that can include encoded commands. The command device is programed to send the chirp packet. For example, if the command packet is a smart phone, the crip packet encoder may be installed via an app.

Many smart TVs suffer from an interface problem because sending commands to navigate through content using an off-the-shelf, button-based remote control is too cumbersome. The button-based remotes often require users to navigate around the smart TV screen and type text using a single set of arrow buttons.

There are currently ways to send commands to a smart TV using a smartphone that use the touch screen for inputs, but those methods require that the smartphone first be paired with the smart TV over a wireless communication protocol to establish a handshake. The wireless pairing introduces friction into the act of controlling the smart TV with a smartphone, making it harder for the user to navigate. The wireless pairing also means that only one device can control the smart TV at a time. Therefore, if a first user pairs a smartphone to the smart TV and a second user subsequently pairs a smartphone to the smart TV, the first user will need to repeat the pairing process to subsequently control the smart TV again.

In this publication, we present a pairing interface, a novel framework that seeks to eliminate the need for pairing a controlling client device to a target device to operate the target device. The pairing interface works by ultrasonically broadcasting a chirp with a predetermined preamble and codebase from client device to a target device. The client device may comprise a smartphone or any device with any combination of a touch screen, keyboard, or other primitives. The client devices must include an ultrasonic transmitter with codec support. In examples, the client device could also be a smart watch, a tablet, or another device.

The target device can be any device that can receive commands to operate, includes a speaker operable to receive ultrasonic messages, and codec support. The target device may comprise a smart TV, smart watch, or any other device that can receive and execute commands.

The pairing interface sends commands from the client device to the target device using a predetermined chirp preamble and codebase, and this makes it is possible for the target device to directly interpret client device interactions (e.g., typing characters or touchscreen navigation on a smartphone) as a smart TV navigation command (e.g., letters appear in a search box, or a display cursor moves on smart TV display). This may allow for multiple devices, including both a traditional remote control and one or more client devices, to be used as remote controls for a target device. By allowing client devices to send commands to the target device without any pairing steps, the user may have a substantially improved interaction with the target device. For example, a smart TV interface may be navigated using a smartphone touch pad with as much ease as using a dedicated smart TV remote control.

Figure 1

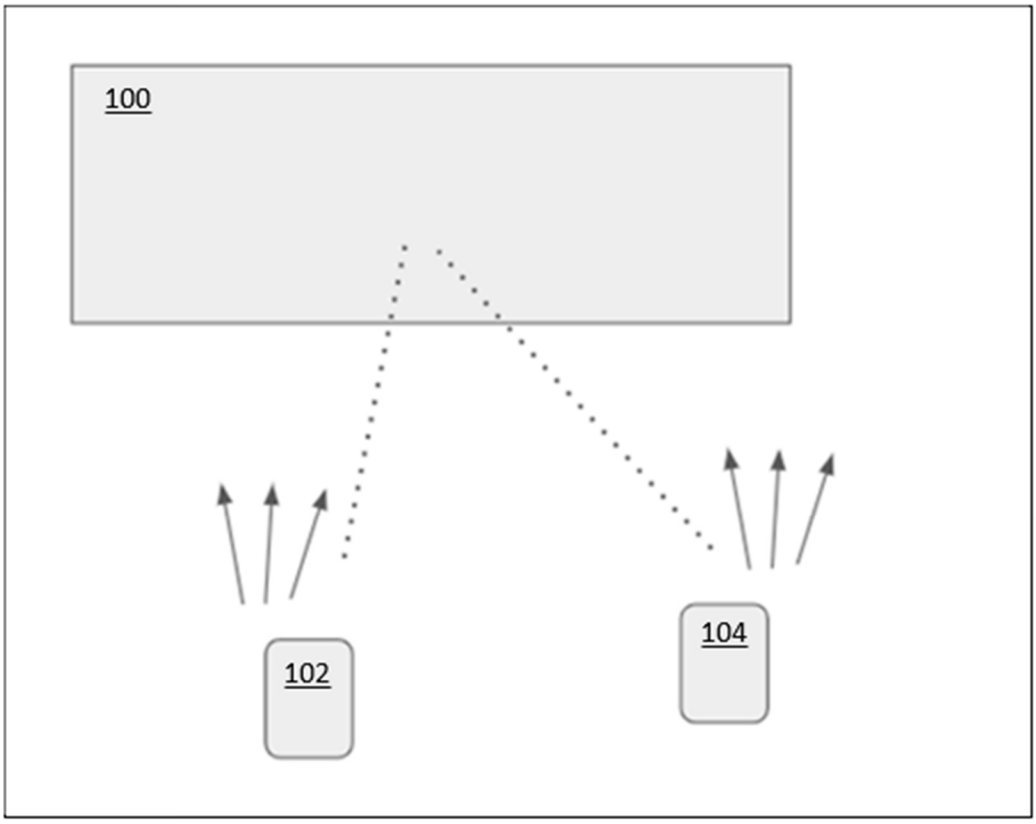

Figure 1 depicts a view of a system including an example target device, a smart TV 100, with a first example client device, a first smartphone 102 associated with a first user. Figure 1 further depicts a second example client device, a second smartphone 104 associated with a second user. The first user may want to use a first smartphone as a control for smart TV. A second user may subsequently want to use a second smartphone as an individual remote control for smart TV. In examples, the first and second users may alternate using their respective devices to control the smart TV in any way desired without needing to explicitly pair either device. In examples, the

system may further include a remote control that is used alternatingly with the first and second smartphones.

Each smartphone 102, 104 may include software with a user interface (UI) to enable the pairing interface feature. In examples, the software may be an application dedicated to the target device, for example a smart TV application. In other examples the smart TV application may be part of another application, for example a home, productivity, or media application. The pairing interface may allow smartphones 102, 104 to type characters and make selections on smart TV 100.

Figure 2

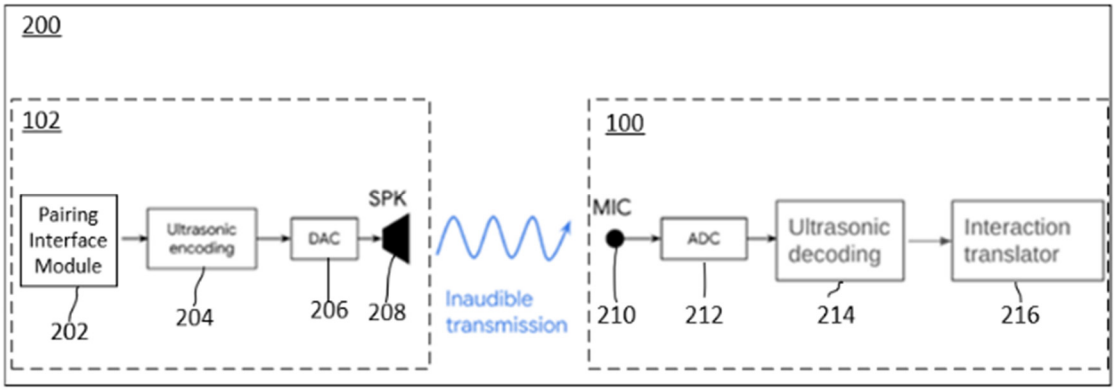

Figure 2 above depicts a block diagram of each of first smartphone 102 and smart TV 100 executing the pairing interface method. As may be seen, first smartphone 102 includes the pairing interface module 202, an ultrasonic encoding unit 204, a digital to analog converter (DAC) 206, and a speaker 208. Smart TV 100 includes a microphone 100, analog to digital converter 212, ultrasonic decoding unit 214, and an interaction translator 216. The second

smartphone 104 may include similar features as those depicted with respect to first smartphone 102 above.

The pairing interface module 202 executes on first smartphone 102 and includes a UI that allows a user to generate smart TV commands. For example, module 202 may allow a user to select letters on a touch pad keyboard that will be sent to smart TV 100. In other examples, module 202 may allow a user to move a cursor to another location or select a button, text box, or other selectable smart TV elements using a touchscreen interface of smartphone 102. For example, module 202 may send a coordinate to smart TV 100. In examples, the coordinates may be Cartesian, polar, or any other coordinate format.

Ultrasonic encoding module 204 may receive the commands from module 202 and encode them into a chirp packet, or any other packet, for transmission via ultrasonic signal. The chirp packet may uniquely code the actions performed by the user on the pairing interface UI.

In examples, module 204 may transmit the commands to smart TV 100 by multiplexing them. For example:

- 22 - 24 kHz band may be allocated a first type of command, and
- 25 - 27 kHz band may be allocated to a second type of command.

In examples, the first and second types of commands may include touch/swipe navigation and characters.

Figure 3

BINARY CODE ALPHABET REFERENCE

1	A	00001	14	N	01110
2	B	00010	15	O	01111
3	C	00011	16	P	10000
4	D	00100	17	Q	10001
5	E	00101	18	R	10010
6	F	00110	19	S	10011
7	G	00111	20	T	10100
8	H	01000	21	U	10101
9	I	01001	22	V	10110
10	J	01010	23	W	10111
11	K	01011	24	X	11000
12	L	01100	25	Y	11001
13	M	01101	26	Z	11010

Module 204 may transmit the commands to smart TV 100 using phase-key shifted binary code at a specific frequency. For example, Figure 3 depicts a binary code alphabet reference. In examples, module 204 may use the code base of Figure 3 to encode the commands into an ultrasonic signal that may be sent to smart TV 100.

In examples, the chirp packet sent via DAC may include a preamble or header along with the commands. In examples, the chirp packet may include a checksum or other error-detection features.

Returning to Figure 2, the ultrasonic coding may next be sent to digital to analog converter (DAC) 206. DAC 206 may generate an analog signal that may be sent to speaker 208. Speaker

208 may generate the ultrasonic signal itself, multiplexed or single-plexed. In examples, the ultrasonic signal may not be audible to the human ear.

Next the smart TV microphone 210 receives the ultrasonic chirp packet, converting it to an electrical signal. The electrical signal is received by analog to digital converter (ADC) 212.

The digital version of the chirp packet is next received at ultrasonic decoder module 214.

Module 214 can access any predetermined preamble and/or codebase used by smartphone 102 to send commands to smart TV 100. For example, module 214 may use the binary code alphabet reference depicted in Figure 3 to translate the chirp packet signal into commands sent from smartphone 102. For example, the commands may move a cursor to a search bar and enter the characters to spell out, “movie.”

The interaction translator module 216 may then send or execute the related command received from module 214 to operate smart TV 100. This may, for example, cause a search to execute for a film.

In this way, the pairing interface avoids the need to invoke device-to-device pairing. Instead, the pairing interface has a unique approach where the smart TV behaves as a passive receiver to ultrasonic input signals that use the predetermined preamble and/or codebase, and the client devices act as one-way signal injectors.