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Reduced Power Consumption in Idle Mode of Active Pen with Tilt Support

Abstract: The idle mode power consumption of an active pen with tilt support is reduced by modifying the protocol of the two pen transmitters and eliminating the use of a gyro.
This disclosure relates to the field of user input devices.

A technique is disclosed that reduces the power consumption of an active pen with tilt support while in the idle mode.

Active pens are one type of user input device for computers. Such pens include electronic components which enable users to provide input to the computer by writing onto the display of, for example, a notebook or tablet computer or a smartphone. Currently, many active pens have tilt detection, implemented using a 2-transmitter design. An active pen with tilt detection has 2 transmitters, TX1 and TX2. The protocol of TX1 always has beacon, pressure level, button indication, and other information. The protocol of TX2 always has beacon and other information. Beacon is used to determine the position, and the other aspects of the protocol provide secondary information.

However, this approach consumes significant power consumption in the idle mode. As a result, in idle mode the 2 transmitters are shut down, and a gyro is used to detect pen motion and determine if the pen needs to wake up. However, this approach increases pen cost, can lead to unacceptably delayed responses to pen behavior, and can reduce battery life if the pen is woken up mistakenly.

According to the present disclosure, and as understood with reference to the Figure, power consumption of an active pen in idle mode is reduced. As a result, there is no need to shut down the transmitters in idle mode, and no need to use a gyro to judge pen behavior.

The power consumption of TX1 is significantly reduced by simplifying the protocol of TX1. The protocol of TX1 only provides beacon, tip on/off, and button on/off. All other information, such as for example pressure level, are moved to the protocol of TX2. As a result, TX2 consumes significantly more power than TX1.

With the reallocation of protocols between TX1 and TX2, now when the pen goes into idle mode, only the 2nd transmitter is shut down. The 1st transmitter remains awake to detect user interactions and wake up the 2nd transmitter when needed; no gyro is required.

According to the revised protocols, in operation, both TX1 and TX2 are awake in the active state 10. If the pen tip is off and remains off for a predefined time, the pen transitions into the idle state 20. In the idle state, TX2 is in sleep mode, while TX1 remains awake and periodically monitors the tip. If TX1 determines that the tip is on, the pen transitions back into the active state 10.

The disclosed technique advantageously improves the user experience. Because the pen is always awake, a user won’t experience any delay in response. Cost is reduced by the absence of a gyro.
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