Wireless Game Buzzers + Base Station

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# Project Description

* Need to build a few wireless buzzers for board game and trivia nights.
* Must support at least 7 buzzers
* Can be used to show ready signals, or who buzzes in first (multiple game modes)
* Game modes can be switched during operation
* Game modes:
  + Trivia mode
    - Only the first buzzer pressed will light up
    - All others will stay off until reset by the base station/Timer
    - Base station plays customisable noise based on who wins.
  + Ready Mode
    - Buzzers will light up until pressed to indicate that the player is ready
    - Rounds may or may not have a timer to disable the button after a specified duration
    - Once all buzzers are active, Base station plays a sound, and all lights turn off.
  + Turn Mode
    - Only one buzzer will light up when it is the players turn to take action
    - Order is predetermined, but can be changed during a session

# Solution

* The proposed solution is a base-station to slave model.
  + There will be a single base station that houses all logical controls
  + Several wireless buzzers with very basic functionality and low power consumption

## Buzzers

* Each buzzer will consist of:
  + Low power MCU
  + Wireless transceiver (mostly TX)
  + Independent battery supply
  + Button for buzzing in
  + Indicator LEDs for Rx, Tx, First buzz, etc
    - LEDs are cheap, have many!
* When buzzer is first turned on, it connects to the base station to confirm the link.
* After initialisation, the buzzers will only send when the button is pressed.
  + After the buzz, the buzzer will listen for an acknowledgement signal
  + The acknowledge signal can also contain instructions to change game modes

### MCU – Attiny84

* Supply voltage: 2.7 – 5.5
* Arduino compatible (at 8 MHz)
* 14 – pin
* Can be kept low powered by sleeping between button presses.
  + Button can trigger an interrupt to send a buzz signal

### Transceiver – Nrf24l01+

* Supply voltage: 1.9V – 3.6V
* 11.3mA for TX @ 0dBm
* 100m+ range

### Power Supply – 2\*AA (3V)

* 3V unregulated power supply
* Bypasses the need for a regulator, allowing greater efficiency and power conservation

### Button

* Big button
* Preferably all different colours
* Maybe even illuminated
* Generates interrupt to wake up the board
* Nothing special about the buttons electrically

### Indicators

* Power – Always on
* Status – MCU controlled
* Rx – MCU controlled
* TX – MCU controlled
* After initialisation, the RxTx indicators can be changed to suit game mode if desired.
* High intensity LEDs for buzzer light requires a 12V rail.
  + Would need to have a boost converter + switching mosfet suited for 3V

## Base Station

### Interface

### Transceiver

# Materials Required

## Wireless Buzzer (single Unit)



* Note: Production costs decrease with scale

## Base Station



# Equipment Required

* Soldering tools – Basic
* Drill/dremel for enclosure bits

# Procedure

* TBA

# Comments

* TBA

# Add-On Projects

## RGB Controller

* In addition to the base station, the logic can also be routed to an RGB LED controller.
  + Colours can reflect the state of the buzzer signals.
  + As the buzzers have unique colours, the first to buzz in can have their colour illuminating the area.

## Toast-based gaming

* Additional game modes:
  + Toast is put into toaster
    - First one to buzz in after it pops wins the toast.
  + Hunger games:
    - Toast will continue to cook until the last buzzer is pressed
    - The last man standing wins the toast
    - Is test of how much charcoal you are willing to consume to sate your hunger
    - Involves tampering with a toaster and sanity levels