SCIENCE DAY 2023

Topic- To generate a DIY music synthesizer for one octave

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Regarding the circuit

1] 13 pushbuttons, wires, Adapter and 1 speaker used apart from a prototype board, Arduino Uno and solder gun. So 14 pins for digital input. This idea is hence an example of direct digital synthesis which is used to make music synthesizers such as these.
2] One side of all pushbuttons connected to ground
3] Another side of all pushbuttons connected to respective arduino pins
4] The top row of 5 push buttons corresponds to all black keys while the bottom row of 8 push buttons corresponds to the white keys in an octave starting from C in increasing order of frequencies from left to right.
5] Positive terminal of buzzer connected to ground
6] Negative terminal of buzzer connected to arduino pin.
7] 13 semitones = One octave, where semitone is the difference between a white key note and it's corresponding sharp/ flat note.
8] Frequencies of each note are assigned in the code itself. For this octave the frequency of the first note is half of that of the last note.
9] Foam board used in making the keyboard outline (as it's durable and of good quality).
10] The sound of that note will go on as long as I keep the pushbutton corresponding to the note pressed.

Regarding the power source

1] The power source is either a battery or any renewable source of energy (currently in this project it's a solar cell).

2] Battery is connect to arduino using a jack, while solar cell is connected using jumper cables, positive terminal to V_{in} pin and negative terminal to ground.

Renewable Sources of Energy

A renewable source of energy is a source of energy which can be used repeatedly and replenished naturally. We have various forms of renewable energy, but for this project I am using solar energy in the form of a solar cell, and in the future, try to make a miniature hydro energy supply to supply power to the Arduino circuit using water.

About Solar Cell

A **solar cell**, or **photovoltaic cell**, is an electronic device that converts the energy of light directly into electricity by the photovoltaic effect. Solar cells work irrespective of whether the source is sunlight or an artificial light. In addition to producing energy, they can be used as a photodetector, detecting light or other electromagnetic radiation near the visible range, or measuring light intensity.

The operation of a photovoltaic (PV) cell requires three basic attributes:

- The absorption of light, generating electron-hole pairs, unbound electron-hole pairs (via excitons), or plasmons.
- The separation of charge carriers of opposite types.
- The separate extraction of those carriers to an external circuit.

Working

1. Photons in sunlight hit the solar panel and are absorbed by semi-conducting materials like doped silicon
2. Electrons (negatively charged) are excited from their current atomic or molecular orbital (**a region of the most likely location of an electron around an atom/ molecule**). Once excited, an electron can either dissipate is energy as heat and return to the orbital or travel through the cell until it reaches an electrode. Current flows through the material to cancel the potential and this is captured as electricity.
3. An array of solar cells converts solar energy into a usable amount of direct current (DC) electricity.

References

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