

Sonic System Report – Mellotron PureData Patch

The Mellotron is a keyboard instrument that was developed in England in the 1960s. Different from a standard piano or keyboard synthesizer, the Mellotron operates by using samples played back from recordings on analog tape. For this report, the Mellotron's functionality and unique timbre will be broken down and analyzed in order to reproduce a digital emulation of the rare instrument in the form of a PureData patch.

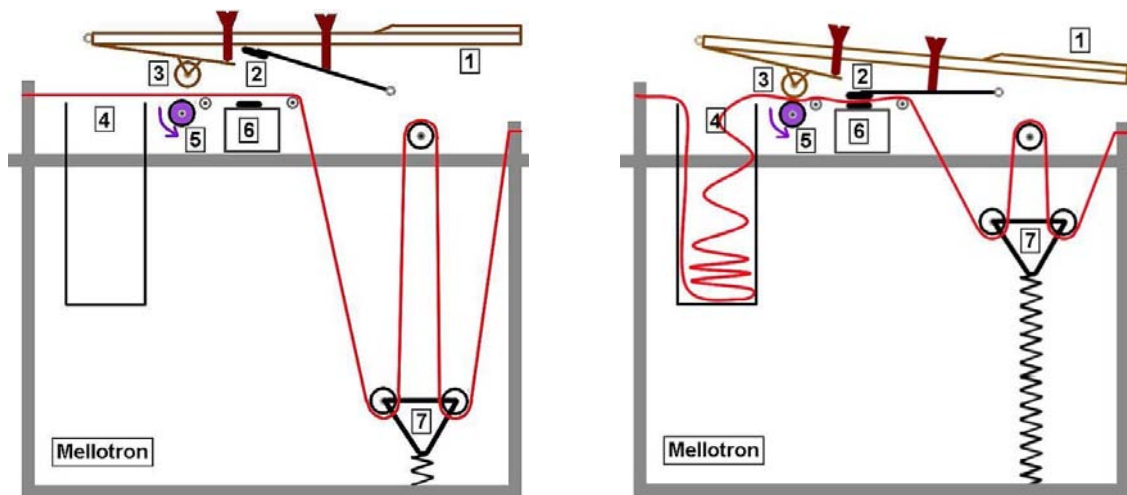
Preceded by tape sampling instruments and experiments in the 1950's¹, the Mellotron was not historically the first keyboard instrument to use analog tape samples. However, it certainly became one of the most well-known sampling instruments. The first Mellotron was developed in Birmingham, England shortly after 1962. Based heavily upon the technology developed by American inventor Harry Chamberlin, Bill Fransen, Chamberlin's sales agent, brought a couple of machines to Britain in order to improve the quality of the instrument and place it in mass production. Following this, the Mellotron was born.

Both musicians and non-musicians seemed to find the instrument fascinating, and the popularity of the Mellotron soared with its ability to replicate the sounds of virtually any instrument. The original purpose was to place "the orchestra" in the home, allowing for anyone with basic keyboard knowledge to perform complicated melodies and backgrounds by simply using two hands. Yet, the technology became a prominent fixture of rock music of the late 1960s and 70s following the Beatles' 1967 recording of "Strawberry Fields Forever" on their *Magical Mystery Tour* LP. Groups including The Moody Blues, Rolling Stones, Pink Floyd, Deep Purple, David Bowie, and many others drove its usage throughout much of the Progressive Rock era.

¹ Le Caine, Hugh. "Dripsody." *Compositions Demonstrations 1946-1974*. By Hugh Le Caine. 1999.

The most basic Mellotrons have a defined set of features that give the instrument its characteristic sound. Most are smaller than a standard piano and can fit inside of a small room. There are 66 keys, and each is affixed to an individual tape head and respective cassette tape found within the body of the instrument.² These cassettes are mounted on a removable rack known as the tape frame, and the interchangeable tape frames contain the “voices” that will be produced by the instrument. Most commonly, the Mellotron came prepackaged with simple flute, violin, and cello voices, but additional tape frames could be purchased or reconfigured to give a greater variety of music.

To play a sound, a key is depressed, engaging the key’s tape head. When the continually spooling tape is caught by the head and fed into a small reservoir. The sound slowly starts up and is produced for a maximum of eight seconds, or the length of the tape. As this is happening, an attached spring is stretched. When released, a spring pulls down on the tape, and resets it for further use in the future.



The Mellotron spools the tape prior to the key being pressed (left). When the key is pressed, the tape head clamps down on the tape, and its content is played (right). When the key is released, the spring pulls the tape back into place.³

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² "Instruments Exist Side By Side." Billboard 6 November 1971: 22, 40.

³ Luna04. Mellotron1, 2. Wikipedia. Mellotron. n.d.

Due to the relatively fragile operations of these instruments, many Mellotrons suffer from jammed tape reservoirs, worn down tape heads, general skipping and play failure, and ripped cassettes. However, it is due to these phenomena that the Mellotron retains its strange timbre. After continuous play, tapes suffer from the effects of *wow* and *flutter*. *Wow* is result of a change in the angular velocity about a curve for which the tapes revolves around. *Flutter* is the effect that occurs when an external vibration due to some force (in this case, friction) cause for a change in the overall sound. Many then describe the resulting sound, given by the crudeness of the mechanisms that govern the Mellotron, as similar to an old radio or record player.

In order to emulate this instrument, it is important to take into account not only the direct sound that the original produces but also the older mechanisms that were outlined above. To do this, the following factors were considered:

- The need to have a loadable array of “tapes” to create tape frames
- An ADSR envelope that would mimic the effect of pressing a key
- The usage of white/pink noise to recreate the effects of tape head reading
- A changing LFO to simulate wow and flutter effects
- The ability to adjust reverb settings
- The randomness of tape jams and failures

Though the implementation that was created is not perfect, many of these characteristics were accounted for and produce favorable results. With this said, many improvements can be made including the following:

- Looking further into using a MIDI controller (keyboard, joystick, etc.)
- Improving instrument transitioning (smoothness)
- Incorporating real-time pitch bending during play

Works Cited

"Instruments Exist Side By Side." Billboard 6 November 1971: 22, 40.

Le Caine, Hugh. "Dripsody." Compositions Demonstrations 1946-1974. By Hugh Le Caine. 1999.

Luna04. Mellotron1, 2. Wikipedia. Mellotron. n.d.

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