

Angklung Robot (Klungbot)

Angklung is a traditional musical instrument that has been acknowledged by UNESCO as an intangible heritage from Indonesia. As an acoustic instrument, angklung is commonly performed by a group of players. Thanks to researchers from Institut Teknologi Bandung, a robot has been built to promote angklung, thus the original angklung sound can be heard anywhere at anytime.



A Klungbot (Angklung Robot) unit comprises of the following parts:

- A set of angklung, mounted in the robot modules.
- One or two robot modules. Each module contains 16 angklungs.
- A computer that runs the robot control software and store the songs.
- Optional speaker amplifier, for producing additional electronic sound (bass, drum, etc)
- Optional MIDI keyboard, for playing the robot manually.

Additionally, the unit can be protected by a transparant enclosure.

The Angklung

Angklung is an acoustic instrument that is made entirely from Bambu. Klungbot includes the best angklung produced by Handiman Diratmasasmita, a respected angklung maker from Bandung, Indonesia. Mr. Handiman uses the bamboo from Surade, Sukabumi, Indonesia, which is well known as the best bamboo for angklung. Moreover, Mr. Handiman has a proven angklung making method, that ensures the produced angklungs have top quality in three aspects:

- *Wiraga*: the body has consistent dimension, rigid, and durable.
- *Wirama*: the sound is pitch perfect, according to diatonic musical standard.
- *Wirasa*: the sound is magical, able to evoke the feeling of the audience.



Technical detail:

- Material : bamboo from Surade, West Java, Indonesia
- Note range :
 - 16 angklungs : G3 – E5 (some chromatic notes are not included)
 - 32 angklungs : F3 – C6 (complete)
- Sound level
 - 50 – 80 dB
- Dimension:
 - Largest (F3) :
 - Smallest (C6) :
- Weight: about 300 – 600 grams (each angklung)

The Robot

Klungbot is designed as a modular system. Each module is a wooden rack that can hold up to 16 angklungs. Inside the rack, there are electro-mechanical arms that can play the angklungs, and a micro-controller unit that controls the arms.

The wooden rack was made in Japara Indonesia. The overall shape was inspired by the crown of wayang orang (a traditional performance from Javanese, Indonesia). Meanwhile, the carving resembles the traditional decorative from Majapahit (ancient culture from Javanese Indonesia).



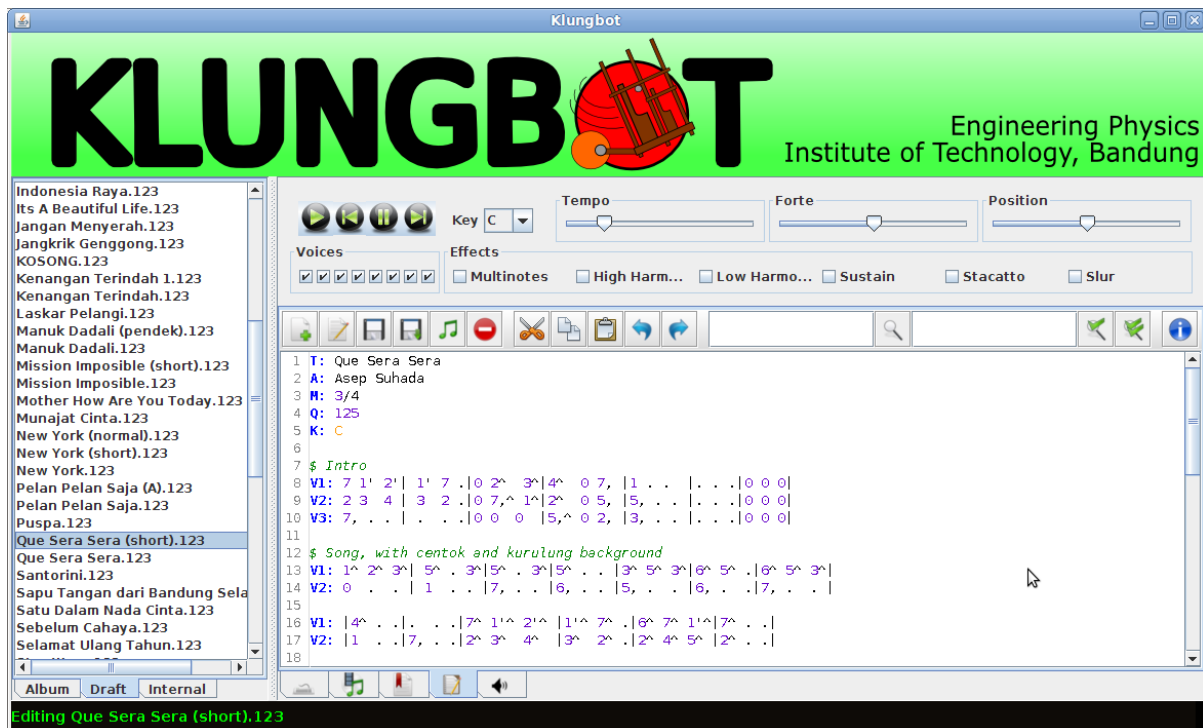
Technical detail:

- Material : Jati wood, from Jepara, Central Java, Indonesia
- Dimension: 110 x 60 x 75 cm (W, D, H)
- Weight: about 20 - 30 kg
- Robot arms : 16
- Robot Controller : Microcontroller
- Communication port to computer : USB
- Communication port for other module : RJ-45
- Electrical input : 12 V / 5A

The Computer

Klungbot system requires a computer that runs the Klungbot Software. The main features of the software are:

- Provides a song editor to compose an angklung arrangement using chipper notation (the preferred musical notation in Indonesia and some Asian countries)
- Can manage the songs library in hierarchical manner, according to the genres.
- Can play the songs automatically to the robot, as well as to the MIDI synthesizers.
- Can receive the input from a MIDI controller, thus a person may play the robot manually.



The Klungbot software is made using the Java platform, thus it can run on any computer with various operating system including Windows, Linux, and OSX. For this particular setup, the computer is a Pipo X9 with the following specification:

- Brand / Model : Pipp X9
- Operating System: Windows 10
- CPU: Intel Baytrail T Z3736F
- RAM: 2G
- ROM: 32G
- Wireless: WiFi IEEE 802.11 b/g/n, Bluetooth4.0
- Interface: TF Card, Micro USB, USB2.0, HDMI, 3.5MM Audio, RJ45
- Power Supply: Charge Adapter

PIPO



Transparent Enclosure

The Klungbot unit can be enclosed to protect it from dust, as well as improper touching. A transparent enclosure will be provided with the following specification:

- Material : Acrylic (transparent)
- Dimension : 120 cm x 60 cm x 80 cm
- Weight : about 10 kg
- Sound attenuation : 20 dB