



Identification of mechatronic systems

Dual-tone multi-frequency (DTMF) – Initial report

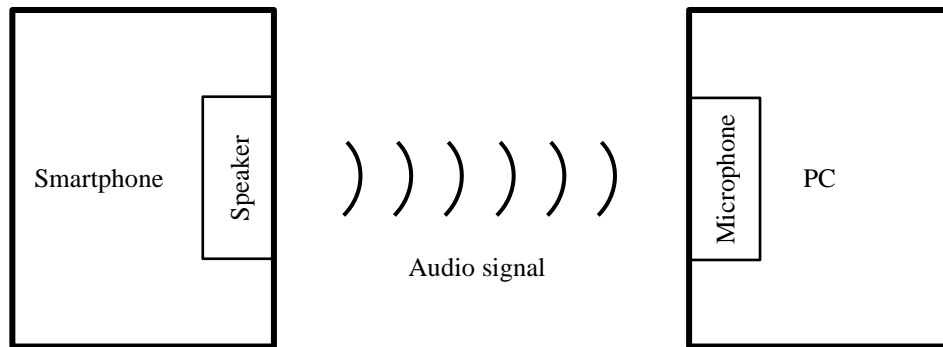
First and last name Jakub Kokosiński Michał Kubik	Faculty IMiR	Field of study IME	Group Thursday 11:30
Academic year 2023/24	Semester VIII	Date of execution 23-03-2024	

TABLE OF CONTENTS

1	Initial assumptions/Scope of work.....	2
2	DTMF – short description	2

1 INITIAL ASSUMPTIONS/SCOPE OF WORK

In the scope of the project, the objective is to develop MATLAB code that facilitates user interaction with PC actions using audio signals generated by a smartphone's numerical keypad. This involves capturing audio input from the smartphone's microphone, processing it to filter out noise, and analysing the signal to decode the DTMF frequency pairs corresponding to pressed buttons. The decoded digits or symbols will then be utilized to trigger various actions on the PC.



Additionally, the software will feature a graphical user interface (GUI) allowing the user to start and stop the MATLAB script. The GUI will display real-time visualizations including:

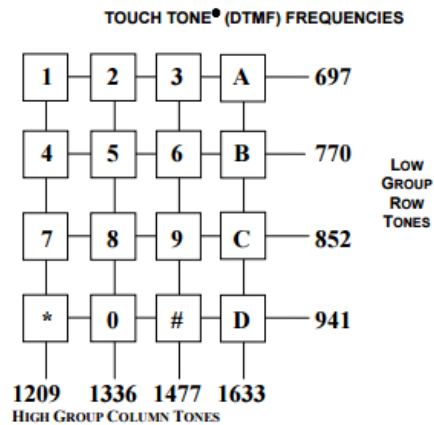
- Time and frequency characteristics of the input signal,
- Time and frequency characteristics of the filtered signal,
- Output signal representing the decoded DTMF symbols.

The additional goal of the project is to utilize these decoded DTMF symbols to control a snake video game, providing an interactive and engaging experience for the user.

2 DTMF – SHORT DESCRIPTION

DTMF, or Dual-Tone Multi-Frequency, is a signalling system used in telecommunication and various applications to encode digits and symbols onto the audio signal transmitted over phone lines. It employs a combination of two simultaneous frequencies to represent each symbol.

The DTMF system consists of a grid of frequencies, with one frequency from a high-frequency group and one from a low-frequency group, forming a unique pair for each digit (0-9) and some additional symbols (* and #). The high-frequency group typically consists of frequencies ranging from 1209 Hz to 1633 Hz, while the low-frequency group ranges from 697 Hz to 941 Hz. When a button on a telephone keypad is pressed, it generates a combination of two frequencies corresponding to that button's position on the grid. These frequency pairs are then decoded at the receiving end to interpret the pressed digit or symbol. DTMF decoding typically involves filtering and analysing the received audio signal to detect the presence of specific frequency combinations.



Source: [sigidwiki.com](https://www.sigidwiki.com/wiki/User:Cartoonman), username: Cartoonman (<https://www.sigidwiki.com/wiki/User:Cartoonman>)

Applications of DTMF include telephone systems for dialling numbers, interactive voice response systems (IVR), automated customer service systems, remote control systems, and more.