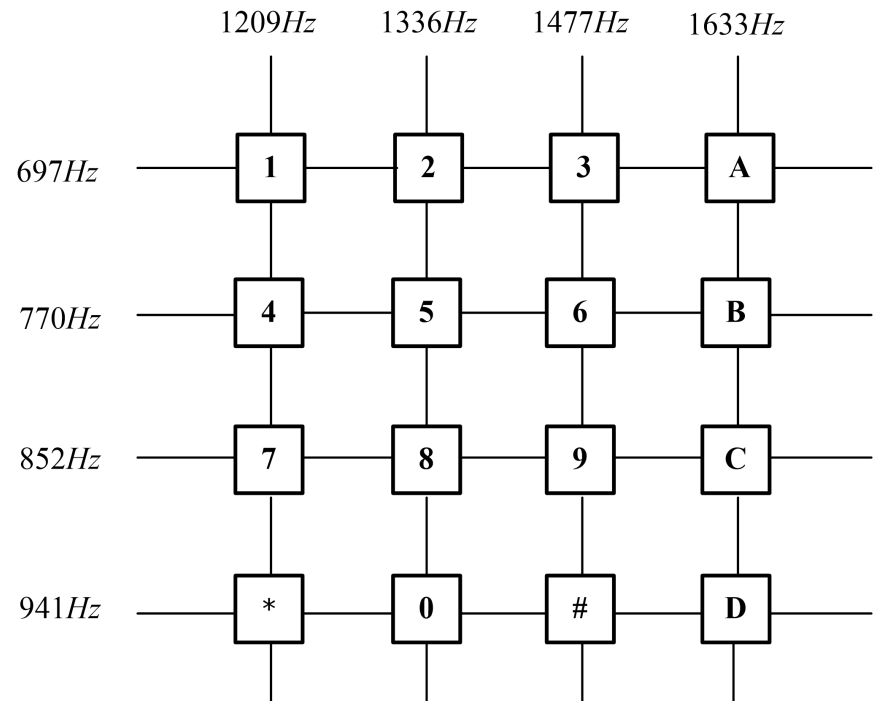# Production and Detection of Dual-Tone Multi-Frequency (DTMF) Signals

Week 6, Tuesday

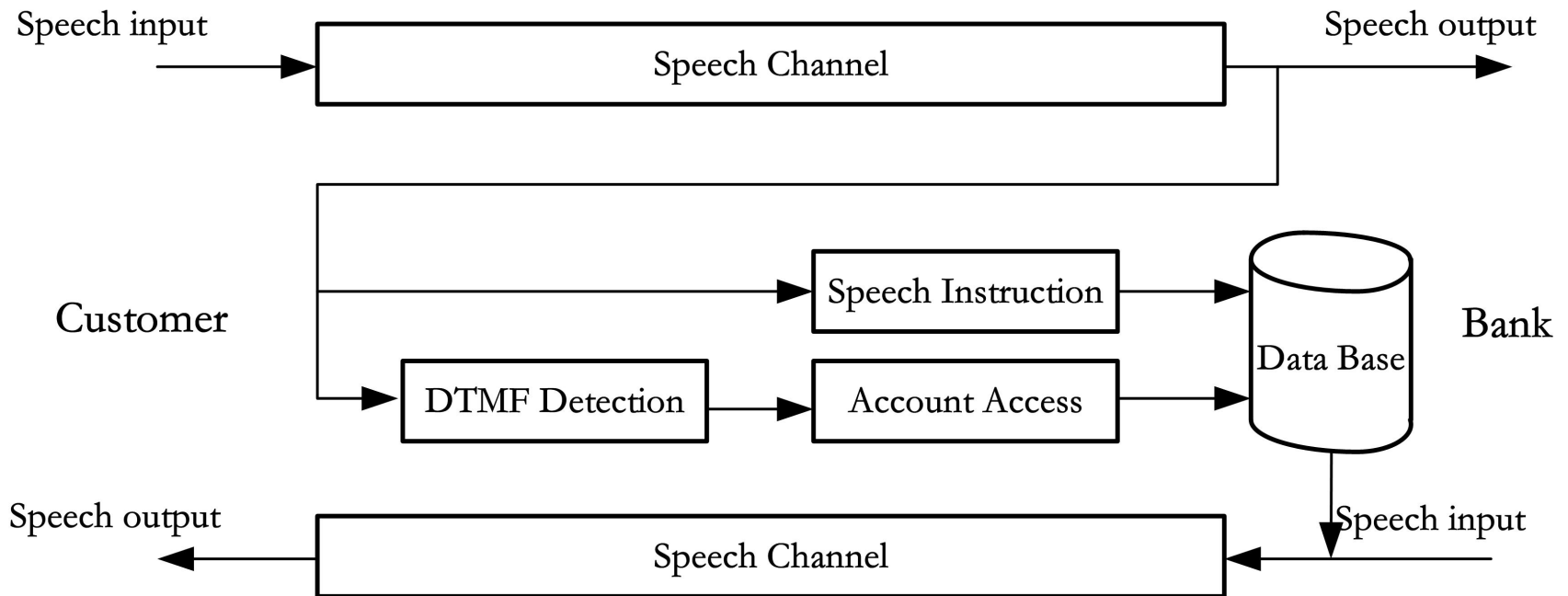Main Build, A1-304

Background

- Dual-Tone Multi-Frequency (DTMF) Signals have been widely used in telephone systems

- Each key in panel corresponds to a signal consisting of two frequency components

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

$$x[n] = \cos\left(2\pi f_L n T_s\right) + \cos\left(2\pi f_H n T_s\right)$$

Application of DTMF Detection

- E.g., Bank Account Info. Query System

Tasks of this project

- **Task 1**: generating DTMF signals;
  - □ Press one key → generating a signal consisting of two frequency components;
- **Task 2**: detecting DTMF signals;
  - □ Receive the signals → find the key being pressed;
- **Platform**: MATLAB
- **Results**: Code, simulation results and report

Methodologies

- **DTMF generation (NOT limited to)**
  - ☐ Method 1: MATLAB instructions `sin( ), cos( )`
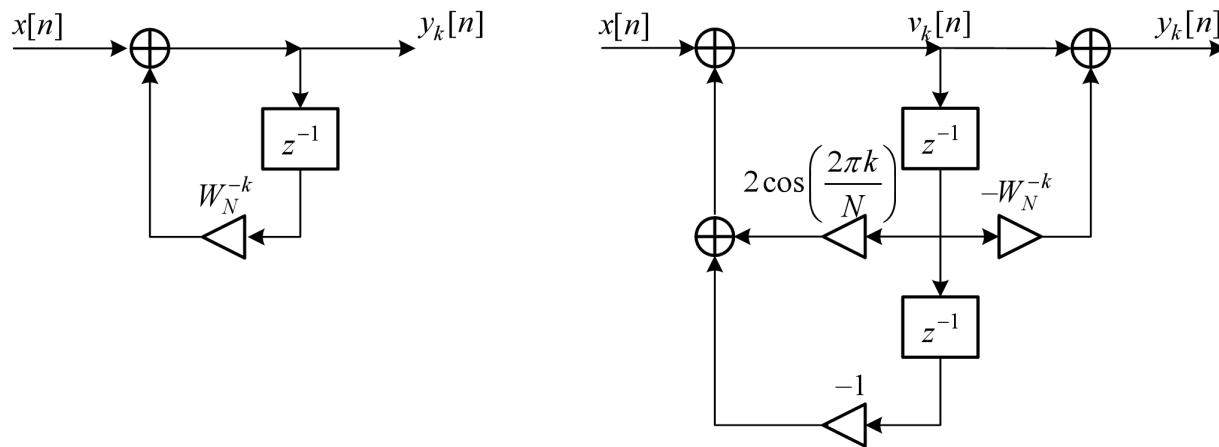 - ☐ Method 2: Look-up table
  - ☐ Method 3: Digital oscillator
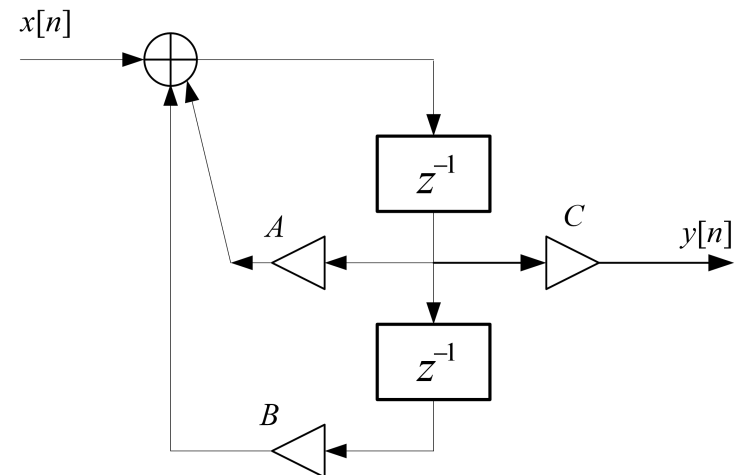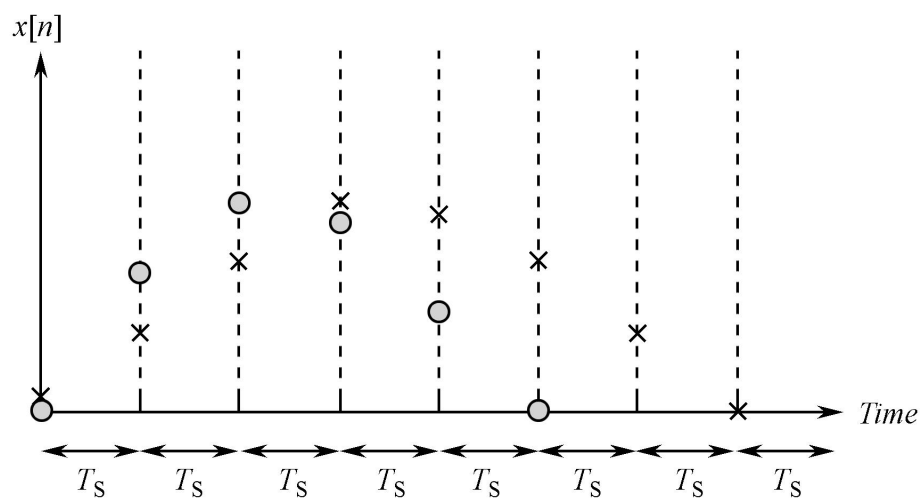
  - ☐ Method 1, basic requirement, low score
  - ☐ Method 2 or 3, advanced requirement, high score

Methodologies

- **DTMF detection (NOT limited to)**
  - Method 1: DFT/FFT
  - Method 2: Goertzel algo. (11.3.1)

  - Method 3: All-pole LPC (linear prediction coding)

$$H(z) = \frac{1}{1 - \sum\limits_{k=1}^{P} a_k z^{-k}}$$

Determine a_k such that

$$h[n] \approx \cos\left(2\pi f_L n T_s\right) + \cos\left(2\pi f_H n T_s\right)$$

Report

- Submit the report in pdf format (we do NOT accept doc or docx format)
- Software: LaTex / CTex, word, wps
- Template (see the attached files)