

# Communications Infrastructure

CSE 490c



# Administrivia

- Office Hours
  - Richard Anderson, Wed, 2:30-3:20, CSE 582
  - Samia Ibtasam, Tues, 4:00-4:50, CSE 007
  - Naveena Karusala, Mon, 4:00-4:50, CSE 220
- Homework #1, Due Wednesday.
- Programming Assignment #1, Available Wednesday. To get started, create Twilio account and build Hello World Application
  - Possibly we will have a lab session for this

# Basic Mobile Phones



Nokia 105  
Quad band, GSM,  
Dual Sim  
999 rs



Fero F1100  
1.2 MP Camera  
900/1800Mhz  
GPRS  
BlueTooth  
1050 Ksh



Viva V1  
Single Sim, 2G  
Flashlight, Snake  
432 rs



Tecno T350  
GSM 900 Mhz  
Camera, Radio,  
Facebook, Palmchat  
5100 Ngn

# Handset Constraints

- Connectivity
- Simcard Ownership
- Simcard Registration
- Airtime Balance
- Electrical charging
- Handset Cost



# Basic Mobile Phones (GSM Standard)

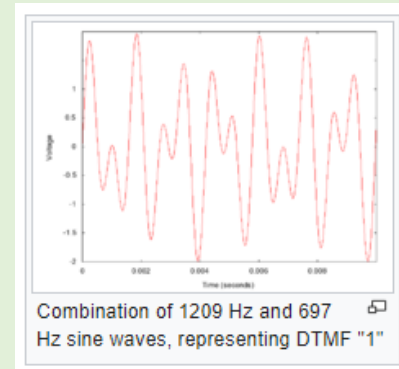
- Voice
- DTMF
  - Dual Tone Multi-Frequency
- SMS
  - Short Message Service
- USSD
  - Unstructured Supplementary Service Data

# Voice + DTMF

- Analog signal for sound waves
- Converted by handset to digital data for transmission
- Multiple codecs can be used for conversion
- Voice Fundamental Frequency:
  - Male (85 to 180 Hz), Female (165 to 255 Hz)
- Speaking frequency 20Hz to 20000 Hz
- Audible through 20000 Hz
- Telephony: Frequency band 300Hz to 3400 Hz.

DTMF keypad frequencies (with sound clips)

	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



# SMS (Short Messaging Service)

- Defined in 1985 as part of the GSM Standard
- Protocol allows sending of up to 160 character alpha-numeric messages
- The hard thing in designing SMS was getting an agreed upon standard
  - Deutsche Telekom + France Telecom
- The first SMS was sent over Vodafone GSM Network on December 3, 1992 in the UK
- Initial growth was very slow, significant growth around 2000
  - Designed for Engineers
  - Took off when European Teenagers started using it
- SMS Gateway services are very important for building SMS applications – more later
- Hack: You can send SMS from email – 206375██████@tmomail.net

# Trivia

- What was the content of the first voice call? (Alexander Graham Bell to Thomas Watson, March 10, 1876)
- What was the content of the first text message? (Neil Papworth to Richard Jarvis, December 3, 1992)
- Why are SMS messages limited to 160 Characters.



# SMS Challenges

- Character limitation
- Expense
- Character Set – restricted to basic Latin characters (7-bit characters)
  - Unicode extensions require 16 bit – greatly reducing message length
- Difficulty of entering letters on a keypad
- Reliability



# USSD Unstructured Supplementary Service Data



- Session based protocol for communicating by text between handset and service provider
- Initiated with a short code, e.g., \*144# to check Safaricom balance
- 160 character strings sent back and forth between handset and provider until session is terminated
- Key differences from SMS
  - Synchronized communication
  - Direct with service provider: better security
  - Does not leave messages on the phone
- Applications
  - Adding services to cell service
  - Mobile Money
  - Yellow Pages Directory

# Universal Apps (Trevor Perrier)

