

# Human-Computer Interaction

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# Human

- a person who tries to accomplish a goal
- the end-user
- the member of an organization

# Computer

runs applications (software)





# Interface

- A point where two objects meet
- A point where human can tell the computer what to do
- A point where the computer displays the requested information



# Interaction

“dialogue” between humans and computers



# Types of Interfaces

- **Command Line Interface (CLI)**

A CLI displays a prompt, the user types a command on the keyboard, the computer executes the command and provides textual output.

- **Menu Driven Interface**

The user has a list of items to choose from, and can make selections by highlighting one.

- **Graphical User Interface (GUI)**

Uses windows, icons, menus and pointers (WIMP) which can be manipulated by a mouse (and often to an extent by a keyboard as well).

- **Natural Language Interface**

Can range from simple command systems to voice activated text processing. Commands are spoken in “normal” language.

# COMMAND LINE INTERFACE

- **Advantages**

- Very flexible with the use of “switches” (options)
- Good for “expert” users - can quickly access commands
- Uses the fewest system resources

- **Disadvantages**

- Requires the user to learn “complex” commands or language
- “Hidden” features i.e. if the command is unknown we cannot make use of that feature
- Not very good for novice users



# COMMAND LINE INTERFACE

```
Terminal
jmoeller@mediatest: ~
jmoeller@mediatest:~$ ps -elf
F S UID          PID  PPID  C PRI  MI ADDR  SZ  WCHAN  STIME TT
4 S root           1      0   0  88   0 -    982 poll_s Dec18 ?
1 S root           2      0   0  88   0 -     0 kthrea Dec18 ?
1 S root           3      2   0  88   0 -     0 snpboo Dec18 ?
1 S root           5      2   0  60 -20 -     0 worker Dec18 ?
1 S root           6      2   0  88   0 -     0 worker Dec18 ?
1 S root           7      2   0   0   0 -     0   Dec18 ?
1 S root           8      2   0   0   0 -     0   Dec18 ?
1 S root           9      2   0   0   0 -     0   Dec18 ?
5 S root          10     2   0   0   0 -     0   Dec18 ?
1 S root          11     2   0   0   0 -     0   Dec18 ?
5 S root          12     2   0   0   0 -     0   Dec18 ?
1 S root          13     2   0   0   0 -     0   Dec18 ?
1 S root          14     2   0   0   0 -     0   Dec18 ?

[root@localhost ~]# ping -q fa.wikipedia.org
PING text.pntpa.wikimedia.org (208.80.152.2) 56(84) bytes of data:
^C
--- text.pntpa.wikimedia.org ping statistics ---
 1 packets transmitted, 1 received, 0% packet loss, time 0ms
 rtt min/avg/max/mdev = 540.528/540.528/540.528/0.000 ms
[root@localhost ~]# pwd
/root
[root@localhost ~]# cd /var
[root@localhost var]# ls -la
total 72
drwxr-xr-x. 18 root root 4096 Jul 30 22:43 .
drwxr-xr-x. 23 root root 4096 Sep 14 20:42 ..
drwxr-xr-x.  2 root root 4096 May 14 00:15 account
drwxr-xr-x. 11 root root 4096 Jul 31 22:26 cache
drwxr-xr-x.  3 root root 4096 May 18 16:03 db
drwxr-xr-x.  3 root root 4096 May 18 16:03 empty
drwxr-xr-x.  2 root root 4096 May 18 16:03 games
drwxrwx-T.  2 root gdm  4096 Jun  2 18:39 gdm
drwxr-xr-x. 38 root root 4096 May 18 16:03 lib
drwxr-xr-x.  2 root root 4096 May 18 16:03 local
lnwxrwxrwx. 1 root root   11 May 14 00:12 lock -> ../run/lock
drwxr-xr-x. 14 root root 4096 Sep 14 20:42 log
lnwxrwxrwx. 1 root root   10 Jul 30 22:43 mail -> spool/mail
drwxr-xr-x.  2 root root 4096 May 18 16:03 nis
drwxr-xr-x.  2 root root 4096 May 18 16:03 opt
drwxr-xr-x.  2 root root 4096 May 18 16:03 preserve
drwxr-xr-x.  2 root root 4096 Jul  1 22:11 report
lnwxrwxrwx. 1 root root   6 May 14 00:12 run -> ../run
drwxr-xr-x. 14 root root 4096 May 18 16:03 spool
drwxrwxrwt.  4 root root 4096 Sep 12 23:50 tmp
drwxr-xr-x.  2 root root 4096 May 18 16:03 yp
[root@localhost var]# yum search wiki
Loaded plugins: langpacks, presto, refresh-packagekit, remove-with-leaves
rpmfusion-free-updates                               | 2.7 kB | 00:00
rpmfusion-free-updates/primary_db                    | 206 kB | 00:04
rpmfusion-nonfree-updates                             | 2.7 kB | 00:00
updates/metalink                                     | 5.9 kB | 00:00
updates                                               | 4.7 kB | 00:00
updates/primary_db                                   73% |=====| | 62 kB/s | 2.6 MB | 00:15 ETA
```



# MENU DRIVEN INTERFACE

- **Advantages**

- No need to learn complex commands/language
- Easier for a novice to learn/use
- Ideal when there are a limited number of options (efficient)

- **Disadvantages**

- Can be frustrating for experienced users i.e. the command they want to use is buried 5 levels deep.
- User interface maybe limited by screen space and number of options available.

# MENU DRIVEN INTERFACE





# GRAPHICAL USER INTERFACE

- **ADVANTAGES**

- Most suitable interface for inexperienced or novice users
- Many generic packages for a GUI will share common features

- **Disadvantages**

- GUIs use more system resources than other types of interface



# GRAPHICAL USER





# NATURAL LANGUAGE INTERFACE

- **Advantages**

- No training required

- Can be quicker than keyboard entry

- Hands-free

- Can be used by the disabled

- **Disadvantages**

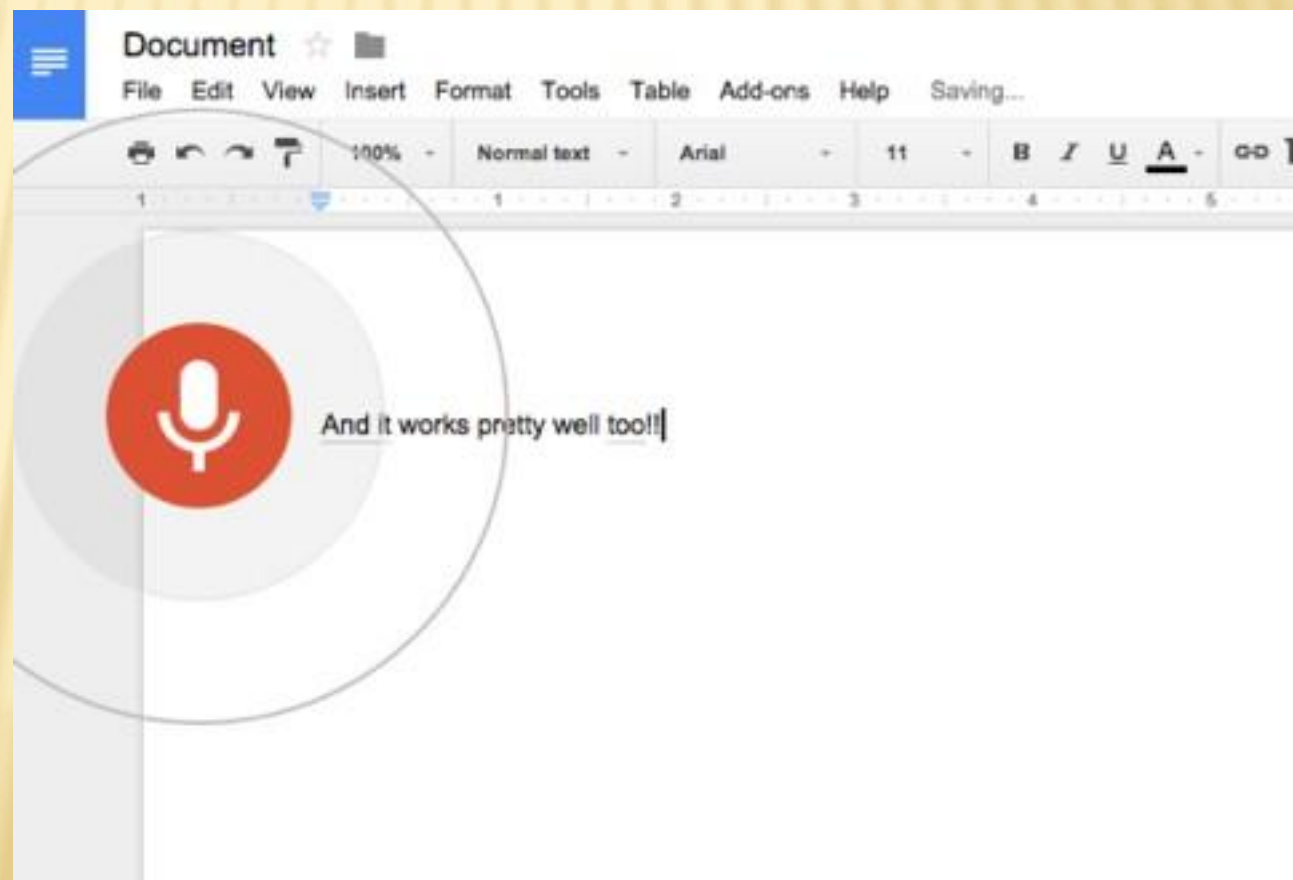
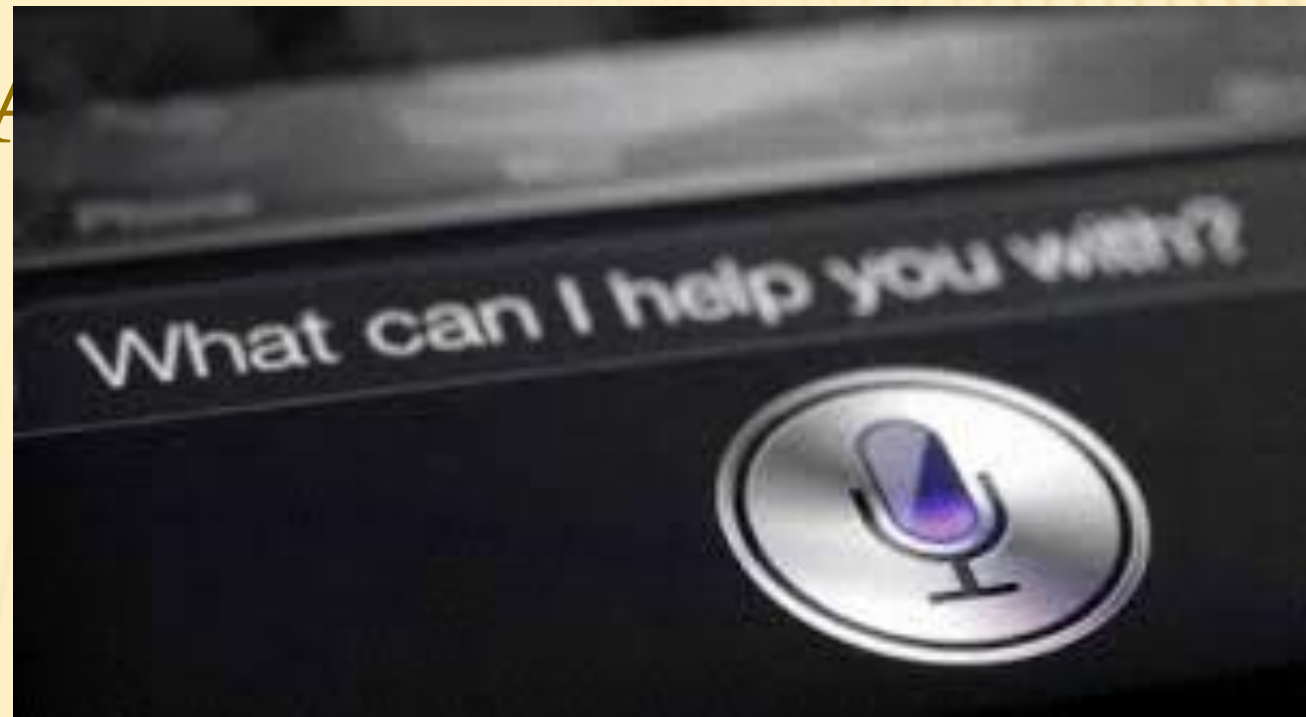
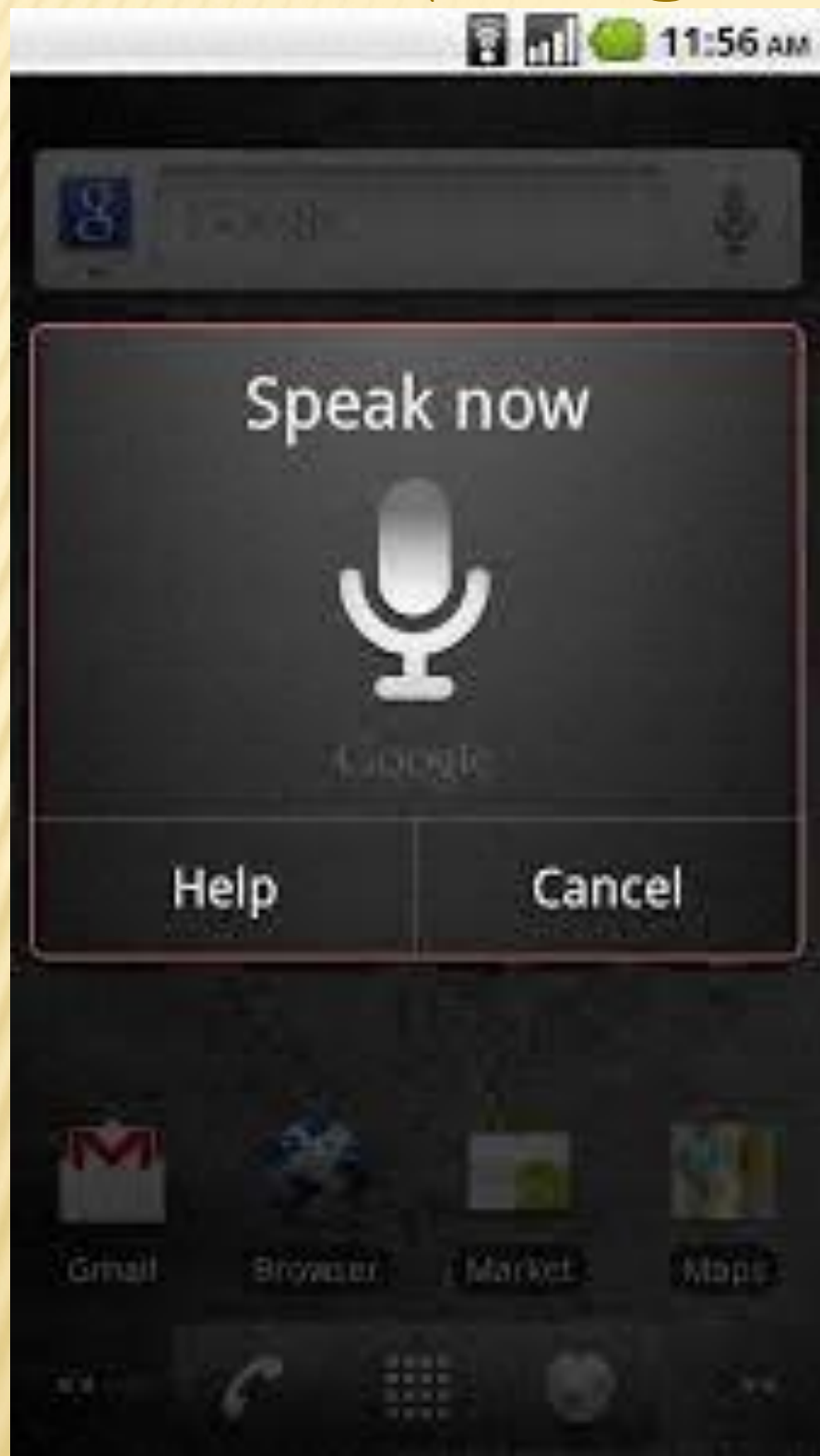
- Emerging technology – still contains “bugs”

- Difficulty in dealing with homonyms

- Difficult to recognize all the different ways of saying things (and regional dialects)



# NATURAL LANGUAGE





# Architecture

- Architecture of any HCI systems is identified by:
  - Number of inputs and outputs in the system
  - Diversity of inputs and outputs in terms of modality
  - Workings of these diverse input and output for interaction purpose
- Based on different configuration and design of interface, HCI systems can be divided into:
  - Unimodal HCI system

Multimodal HCI system

# UNIMODAL HCI SYSTEM

- An interface mainly relies on number and diversity of its inputs and outputs which are communication channels that enable users to interact with computer via this interface.
- A system that is based on only one modality is called *unimodal*.
- Based on the nature of different modalities, they can be divided into three categories:



# Audio Based HCI

- It deals with information acquired by different audio signals.
- The information gathered from audio signals can be more trustable, helpful and in some cases unique providers of information.

- Key components:



- Microphone

speech recognition) and NLU (natural

- ASR (automatic speech recognition) software

- The main research areas of Audio based HCI are divided into:

- Speech Recognition

- Speaker Recognition

- Auditory Emotion Analysis

- Human Made Noise/Sign Detections



# SENSOR BASED HCI

- It has the wide range of applications in our day-to-day life.
- The common feature in every application is that at least one physical sensor is used between machine and human to provide interaction.
- Some of the sensors range from being to primitive :
  - Pen-Based Interaction
  - Motion Tracking Sensors/Digitizers
  - Haptic Sensors
  - Pressure Sensors





# VISUAL BASED HCI

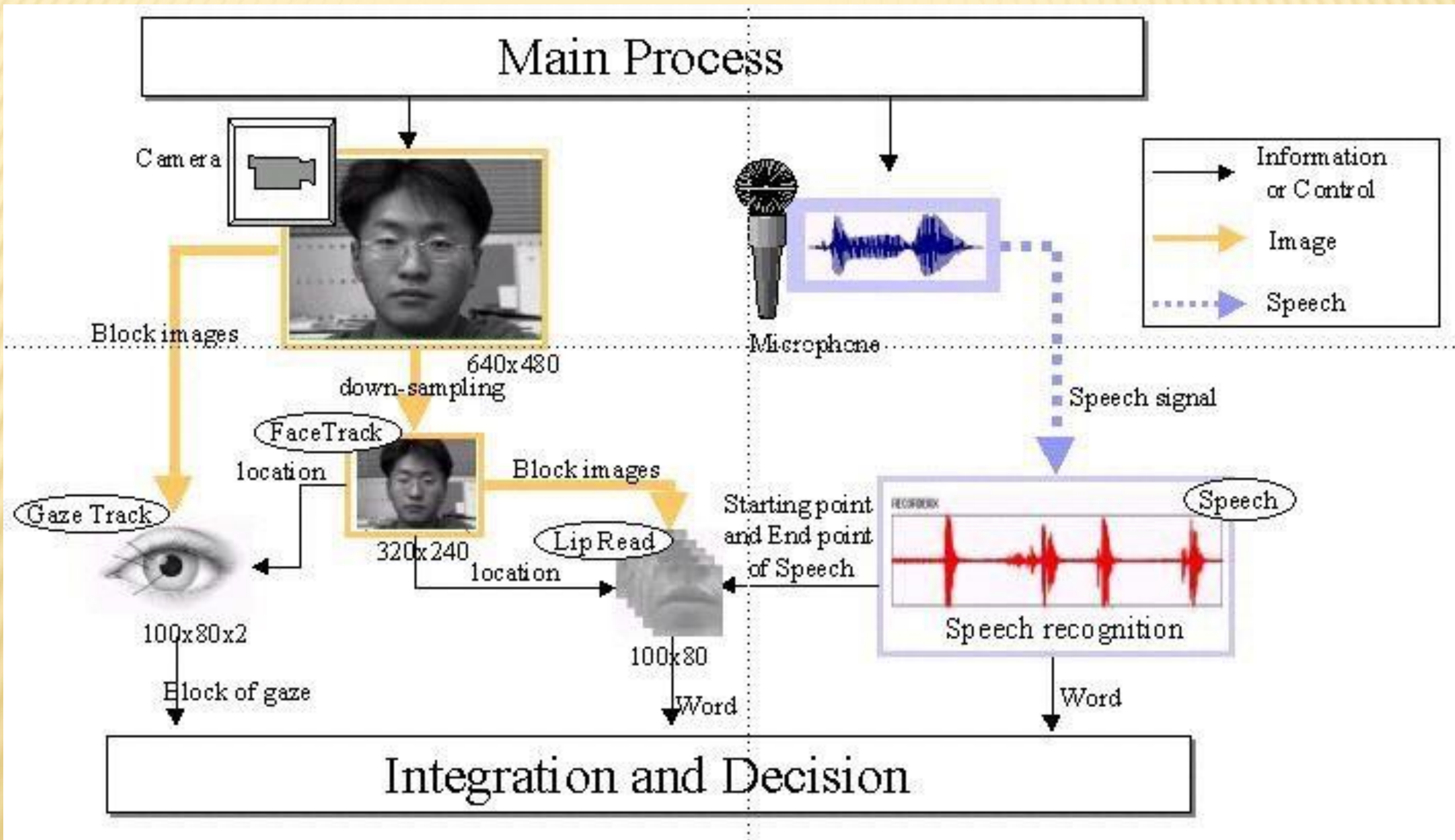
- It is also called as machine vision which is the observation of an environment using cameras.
- In this, different aspects of human responses can be recognised visual signals.
- Detection, identification and tracking of a real life entity and its translation into meaningful machine/computer input.
- The main research areas of visual based HCI are:
  - Facial Expression Analysis
  - Body Movement tracking and Gesture recognition
  - Gaze Detection



# MULTIMODAL HCI SYSTEM

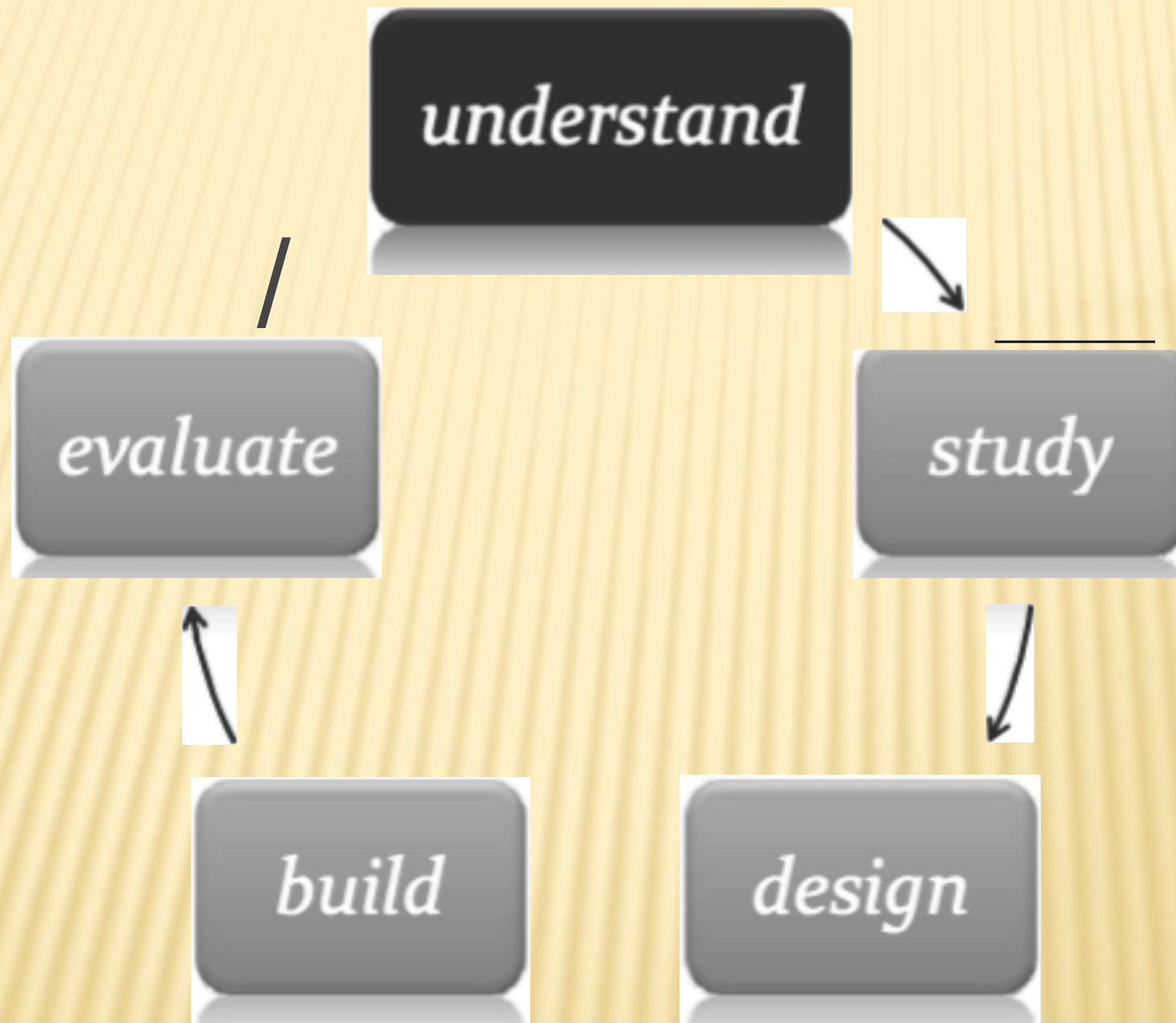
- Combination of multiple modalities, or usage of more than one independent channel signals for the interaction between a user and a machine is termed as multimodal human computer interaction system (MMHCI).
- A multimodal interface acts as a facilitator of human-computer interaction via two or more modes of input.
- It is easy to use by disabled, illiterate people.

# MULTIMODAL HCI SYSTEM





# HCI: process



n:..  
cii  
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a  
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00

## **Interaction design**

- “Designing interactive products to support the way people communicate and interact in their everyday and working lives.”
- Sharp, Rogers & Preece, 2007



# User Experience UX

User experience is the totality of the effect or effects felt by a user as a result of interaction with, and the usage context of, a system, device, or product, including the influences of usability, emotional impact during interaction, and savoring the memory after interaction.

# **Usability**

is the pragmatic component of user experience, including effectiveness, efficiency, productivity, ease-of-use, learnability, retainability, and the pragmatic aspects of user satisfaction.

# **Usefulness**

Usefulness is the component of the UX to which system functionality gives the ability to use the system or product to accomplish the goals of work (or play).



# Functionality

Functionality is power to do work (to play) seated in the non-user-interface computational features and capabilities.

# Emotional Impact

Emotional impact is the affective component of UX that influences user feelings.

Emotional impact includes such effects as pleasure, fun, joy of use, aesthetics, desirability, pleasure, novelty, originality, sensations, coolness, engagement, appeal and can involve deeper emotional factors such self-identity, a feeling of contribution to the world and pride of

# 1

Make Blog

Make a  
personal blog

- Wordpress
- Tumblr
- Blogger
- Medium

# 2

Upload personal  
statement

Your Blog Post #1

- Length: 1000 words or less
- Who I am, and what I have been through
- What I like to learn
- Things that I like

# 3

Upload  
Your Images

Your Blog Post #2

- Upload images of yourself or about yourself
- Pick your 3 favorites
- Tell us why the pic is your favorite