



# Virtual Reality and Its Applications

---

**Pavan Kumar B N**

Department of Computer Science and Engineering



# Virtual Reality and Its Applications

## What is Virtual Reality?

---

Inducing **targeted behavior** in an **organism** by using **artificial sensory stimulation**, while the organism has little or no **awareness** of the interference.

The organism is having an “experience” that was designed by the creator

life form such as a fruit fly, cockroach, fish, rodent, or monkey

Senses of the organism become co-opted, and their inputs are enhanced by artificial stimulation

“fooled” into feeling present in a virtual world. unawareness leads to a sense of presence





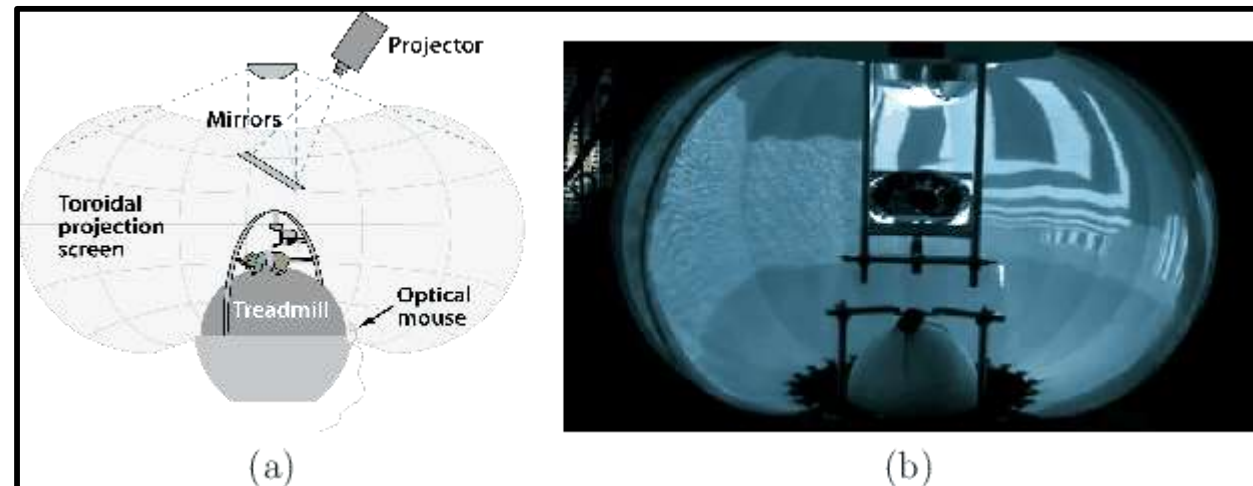
# Virtual Reality and Its Applications

## What is Virtual Reality?



In the Birdly experience from the Zurich University of the Arts, the user, wearing a VR headset, flaps his wings while flying over virtual San Francisco

An experimental setup used by neurobiologists at LMU Munich to present visual stimuli to a gerbil while it runs on a spherical ball that acts as a treadmill



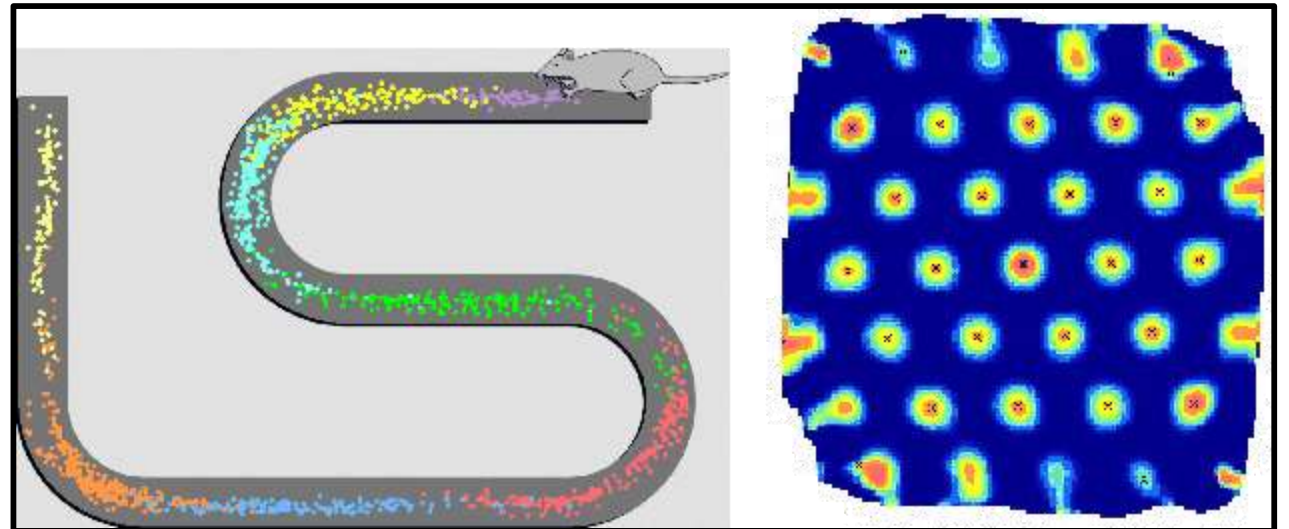
# Virtual Reality and Its Applications

## Testing the boundaries

---

- Listening to music through headphones
- Watching a movie at a theater
- Anyone with modern VR headset and enjoying a session
- Portrait or painting on the wall
- Reading a novel

spatial firing patterns of eight place cells in a rat brain as it runs back and forth along a winding track

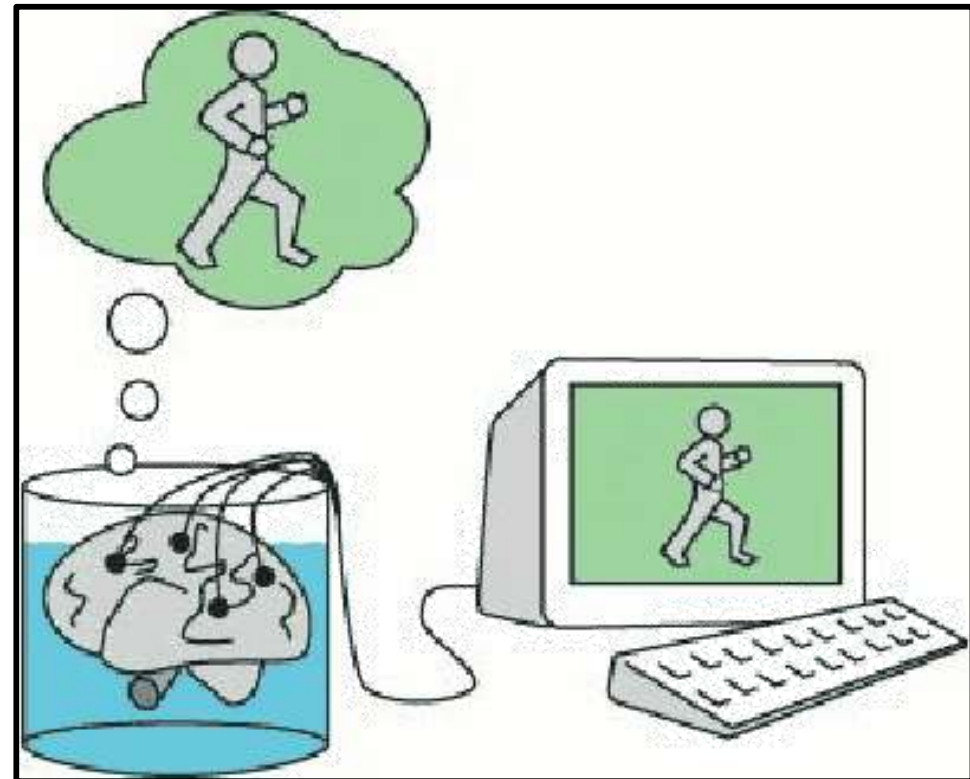


# Virtual Reality and Its Applications

## Who is the fool

- Neural structures composed of place cells are formed that encode spatial information about its surroundings
- Each place cell is activated precisely when the organism returns to a particular location that is covered by it
- Our brains may form place cells for places that are not real!
- This is a clear indication that VR is fooling our brains, at least partially

A VR thought experiment: The brain in a vat, by Gilbert Harman



# Virtual Reality and Its Applications

## Interactivity

---

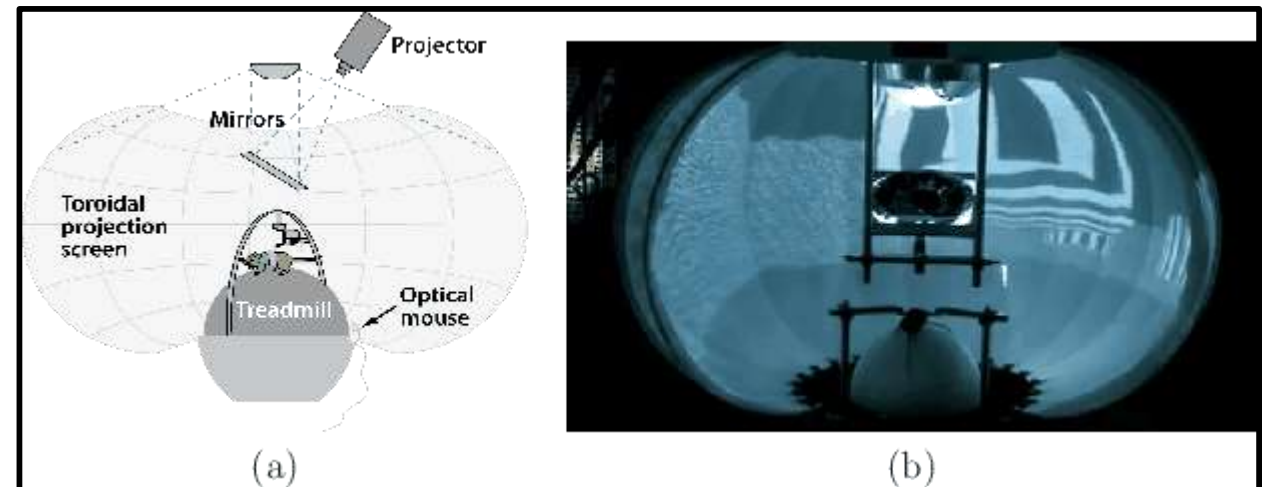
- Most VR experiences involve another crucial component: interaction.
- Does the sensory stimulation depend on actions taken by the organism? If the answer is “no”, then the VR system is called open-loop;
- If the organism has partial control over the sensory stimulation, which could vary as a result of body motions, including eyes, head, hands, or legs, then we are in a closed-loop



# Virtual Reality and Its Applications

## First Person Vs Third Person

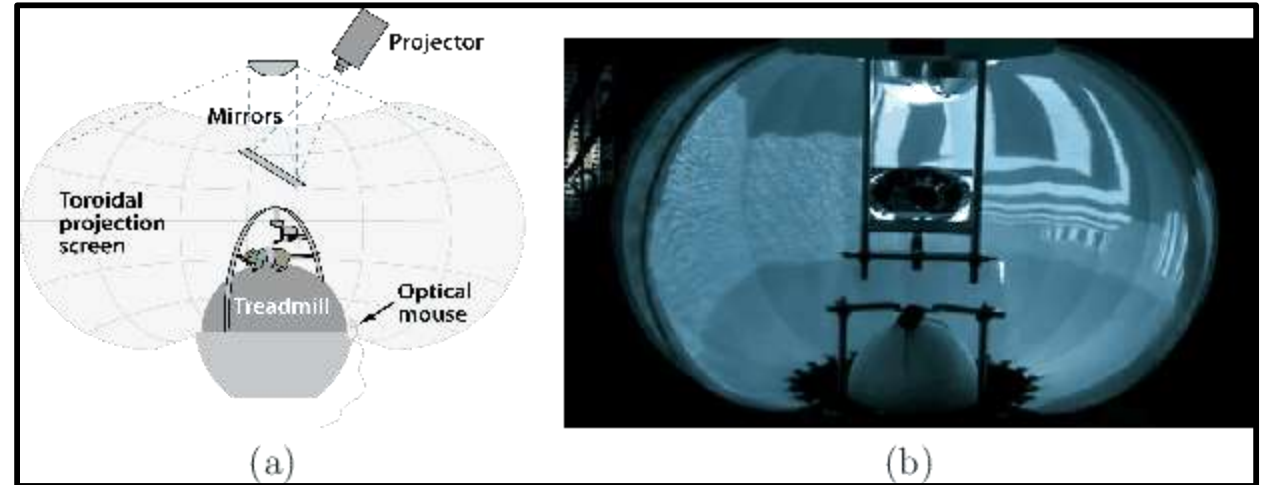
- Subjects have First Person Experiences
- Observers have third-person experience
- Switching back and forth between being the Subjects and observers while evaluating and refining their VR is a **bad Idea!**



# Virtual Reality and Its Applications

## Synthetic Vs Captured

- We may program a *synthetic* world, which is completely invented from geometric primitives and simulated physics
- The world may be *captured* using modern imaging techniques.
- Factor affecting captured
  - What happens when the user changes her head position and viewpoint?
  - What are their facial expressions while wearing a VR headset?
  - What can we infer about their emotional state?
  - Do we need to know their hand gestures?
  - Are their eyes focused on me?



# Virtual Reality and Its Applications

## Modern VR Experiences – Video Games

---



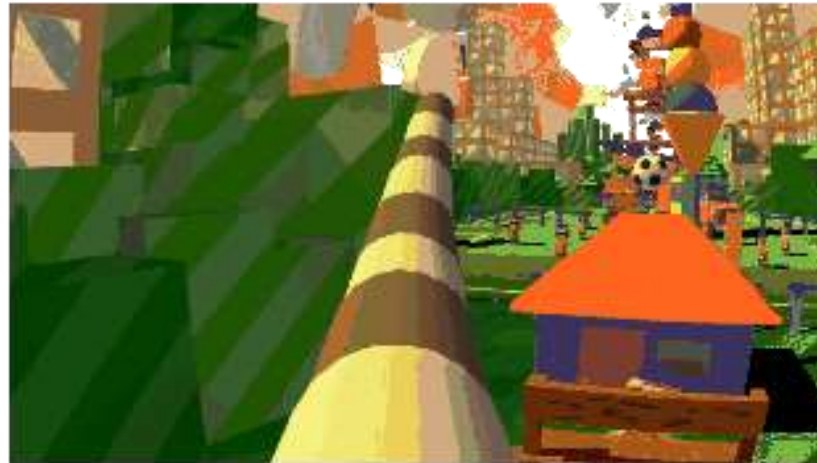
(a)



(b)



(c)



(d)

# Virtual Reality and Its Applications

## Modern VR Experiences – Immersive cinema



In VR, viewers can look in any direction, and perhaps even walk through the scene.

Some questions for the makers

- What should they be allowed to do?
- How do you make sure they do not miss part of the story?
- Should the story be linear, or should it adapt to the viewer's actions?
- Should the viewer be a first-person character in the film, or a third-person observer who is invisible to the other characters?
- How can a group of friends experience a VR film together?
- When are animations more appropriate versus the capture of real scenes?



# Virtual Reality and Its Applications

## Modern VR Experiences – Telepresence

- The first step toward feeling like we are somewhere else is capturing a panoramic view of the remote environment
- Simple VR apps that query the Street View server directly enable a user to feel like he is standing in each of these locations, while easily being able to transition between nearby locations
- By connecting panoramic cameras to robots, the user is even allowed to move around in the remote environment



(a)



(b)



(a)



(b)

# Virtual Reality and Its Applications

## Modern VR Experiences – Virtual societies

---



# Virtual Reality and Its Applications

## Modern VR Experiences – Empathy

---



In Clouds Over Sidra, 2015, offered a first-person perspective on the suffering of Syrian refugees

### The Machine to Be Another





# Virtual Reality and Its Applications

## Modern VR Experiences – Education

---



A flight simulator in use by the US Air Force



A tour of the Nimrud palace



## Virtual Reality and Its Applications

### Modern VR Experiences – Advertisement

---



# Virtual Reality and Its Applications

## Modern VR Experiences – Virtual prototyping

---



# Virtual Reality and Its Applications

## Modern VR Experiences – Health care

---

