MAIA

Lecture activity on

Medical Robotices

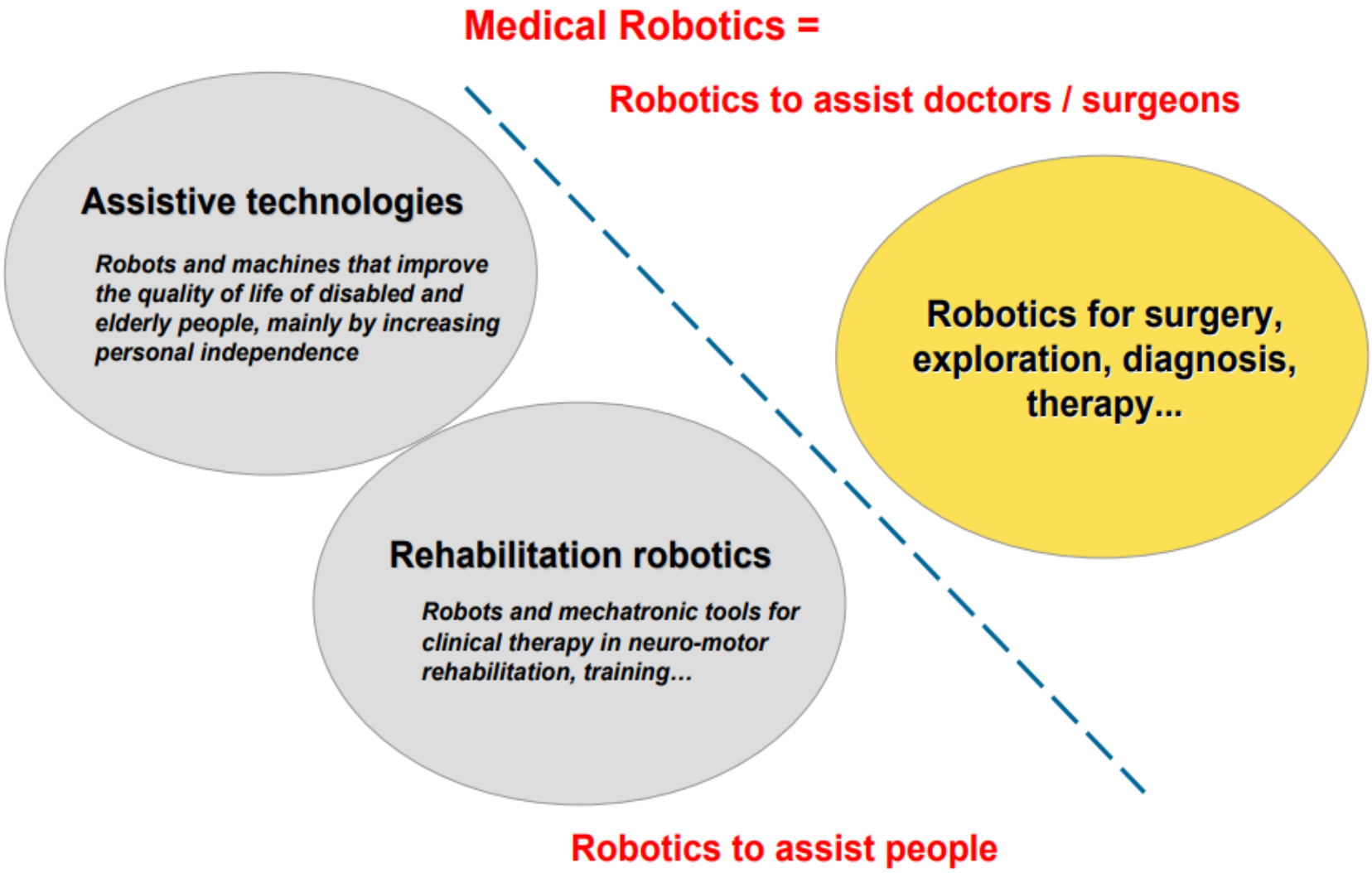
Md. Kamrul Hasan, Fakrul Islam Tushar

Table of Contents

Introduction

A robot is a mechanical device that is capable of performing a variety of often complex human tasks on command or by being programmed in advance.

Introduction



Assistive Technologies

- Social Robots/ Companion Robots

Robots are electronic machines programmed to do thing autonomously.

Humanoid are devices with an overall appearance based on the human body.

Social IA are computer software that are capable of intelligent behavior.

Why Companion Robots?

- **EU Figure** : By 2050 32% of the Europe's total population will be 60 and older.
- **USA Figure:** By 2050 more than 88.5 million people aged 65 and older.
- **Loneliness** and **social isolation** are already problems for many seniors and are even linked to cognitive decline and a higher death rate.
- With the population of seniors expected to rise, many worry that experiences of loneliness will increase, especially if access to care is even more limited.

Why Companion Robots?

- Early studies already show that social robots – autonomous robots trained to interact and communicate with humans – really could address issues of care and social interaction. (Wendy Moyle et al.2013).

- **One recent survey** found that while **68%** people agree robots are beneficial because they can help people, only **26 %** surveyed said they'd be comfortable with a robot providing help and companionship for them if they were in hospital or care. (The Independent, 2019).

Companion Robots

Companion Robots

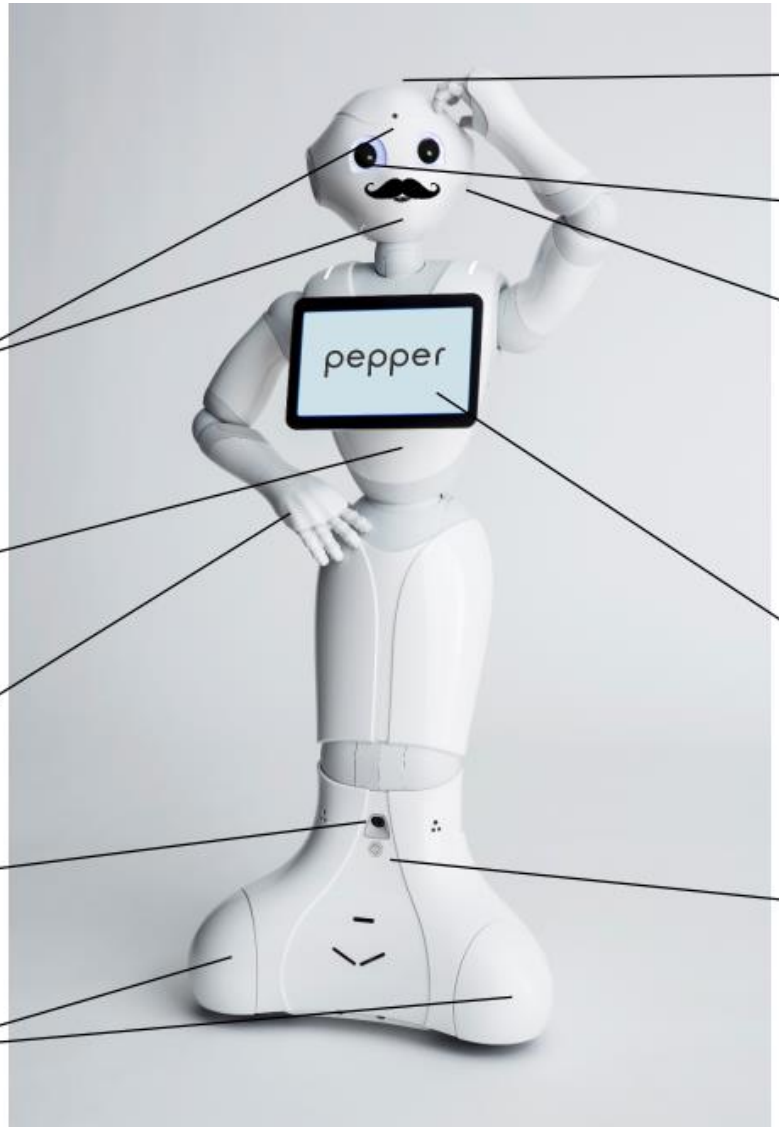
SoftBack Robots

- NAO
- ROMEO
- PEPPER

Companion Robot: PEPPER

HARDWARE OVERVIEW

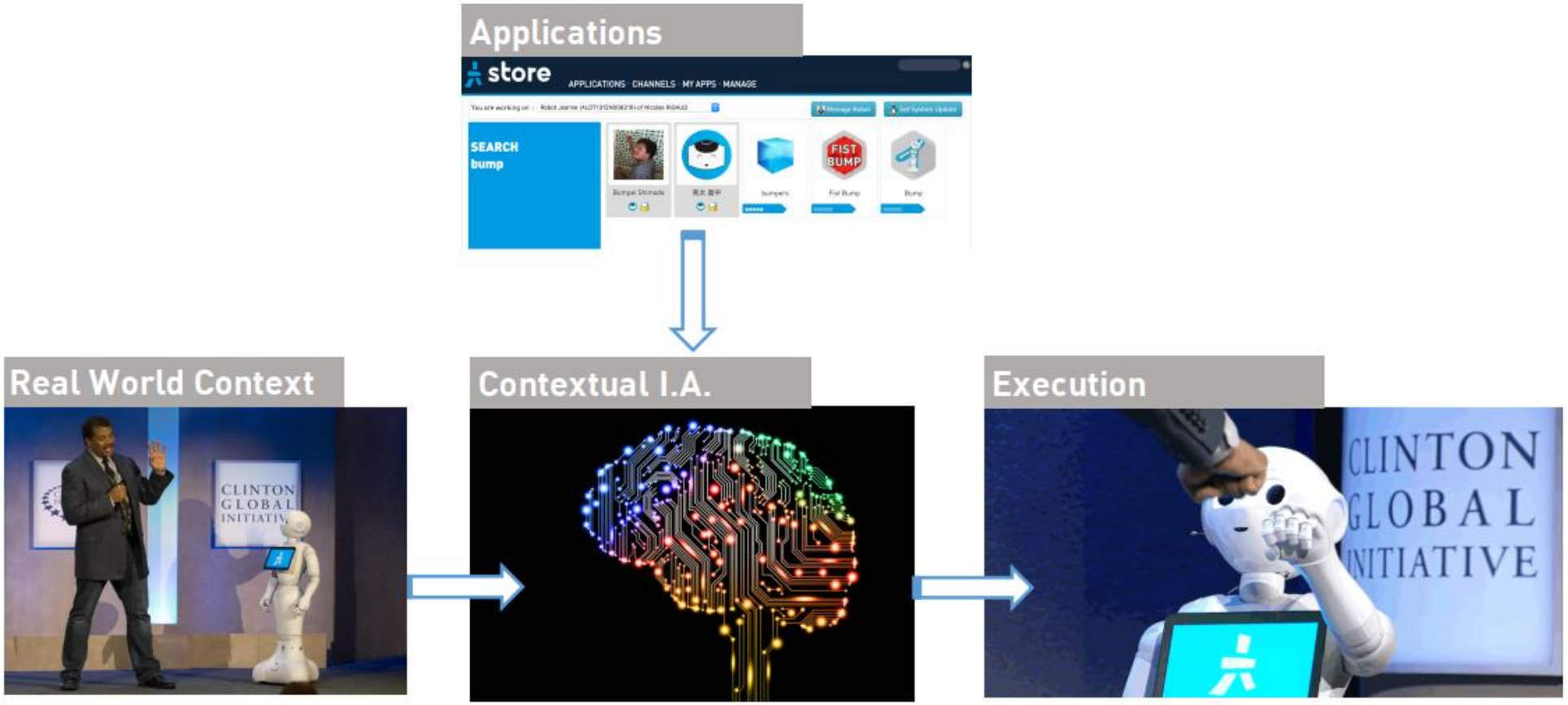
BayTrail processor
Wifi / Ethernet
20 motors
120cm / 4 feet
28kg / 62 lb
12h battery



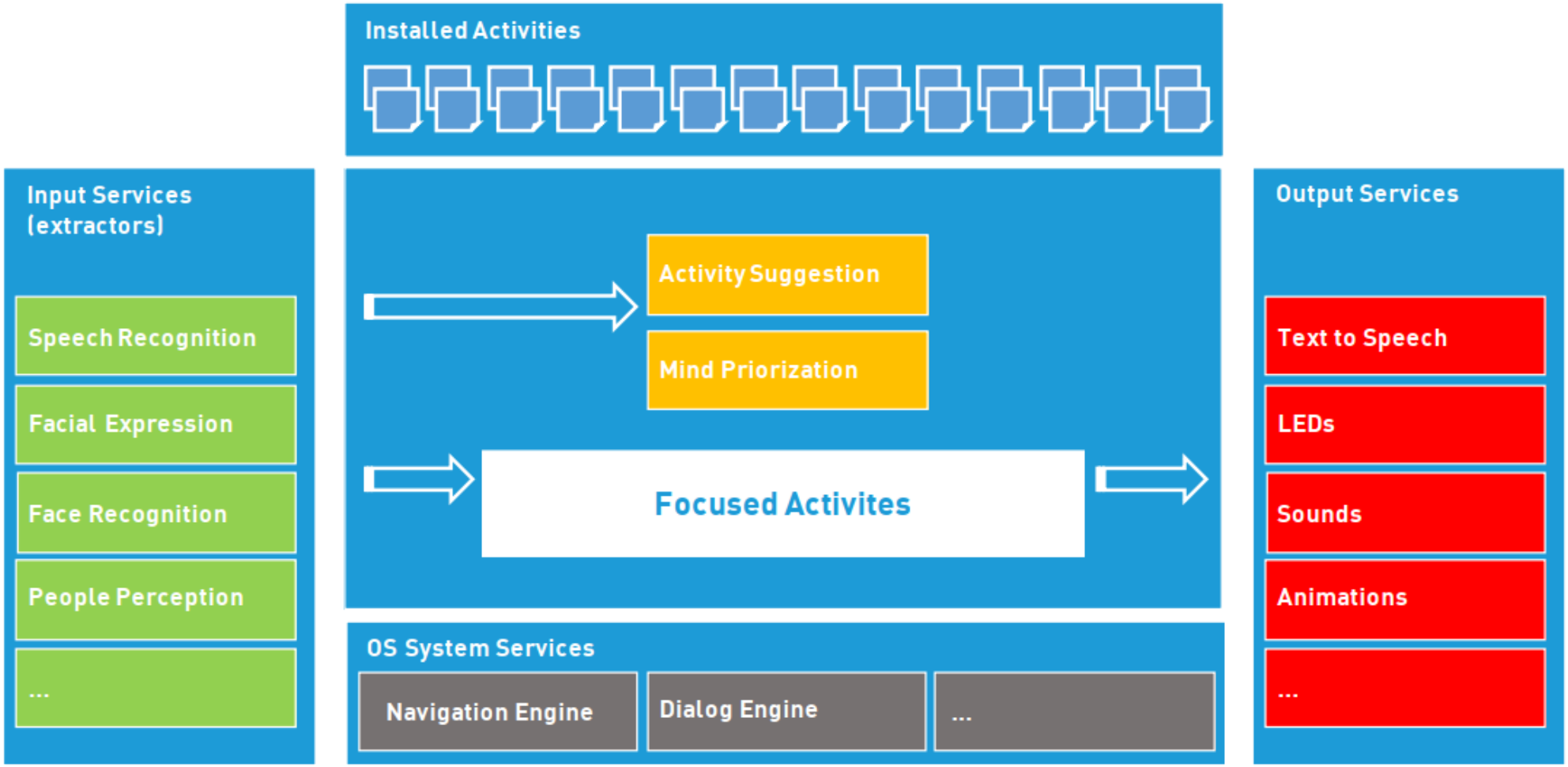
3x Tactile sensor
4x Microphones
2x 3D Sensors
2x Loudspeakers
2x 2D Cameras
Gyroscope
Tablet
2x Tactile sensors
2x Lasers
Sonar
3x Safety bumpers

#MeetPepper

PEPPER: AUTONOMUS LIFE



PEPPER: AUTONOMUS LIFE



Companion Robot: **PARO**

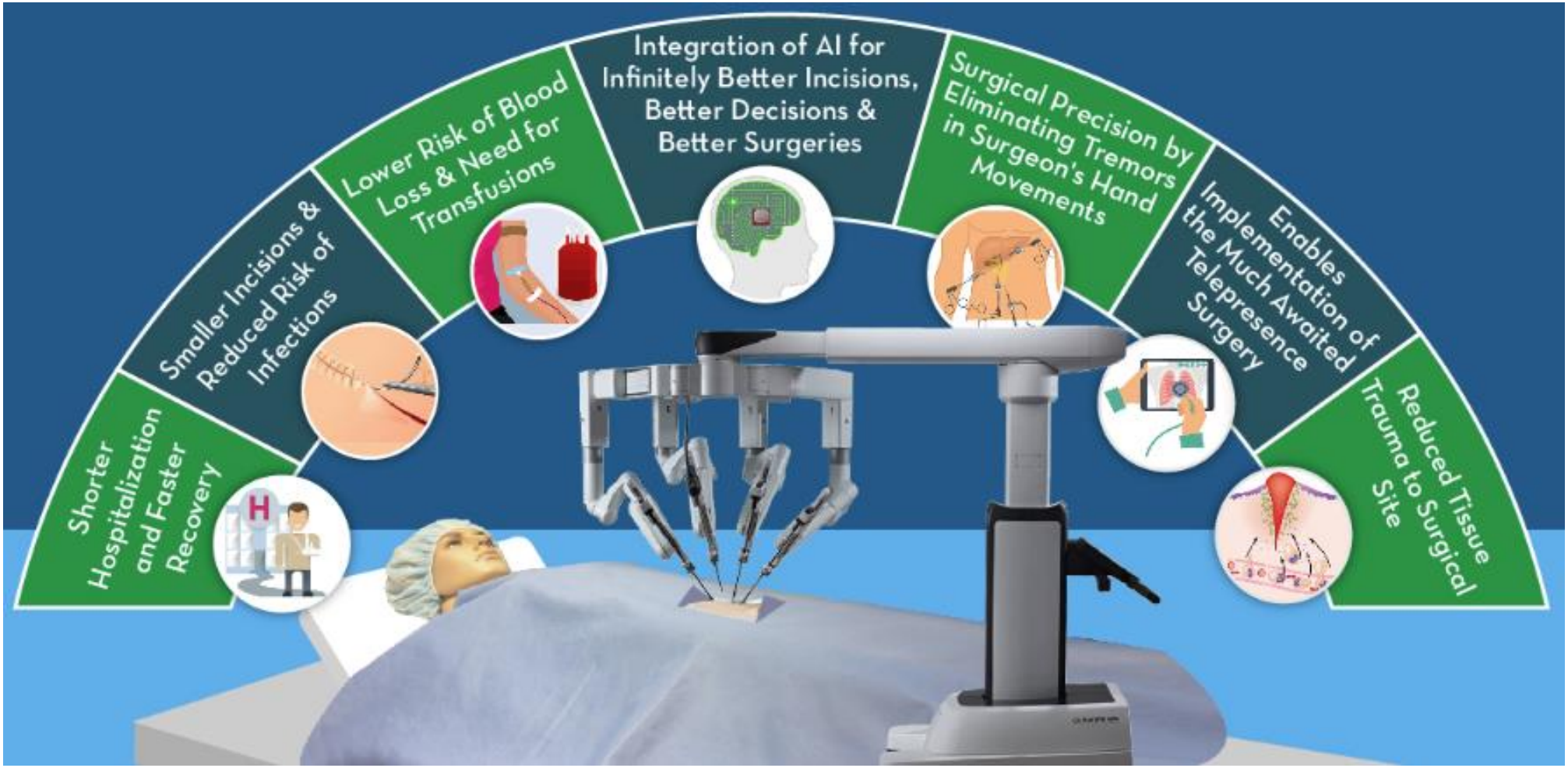
- PARO is a **therapeutic companion robot**
- It has tactile sensors and moves its tail and flippers and opens its eyes when petted
- Artificial intelligence **changes the behaviour** based on sensors that monitor sound, light, temperature and touch.
- Uses sounds to **show emotions such as surprise, happiness, anger and sadness** (cry). It produces sounds similar to areal baby seal and is active during the day and asleep at night.

Why Companion Robots?

- **EU Figure** :People 60 and over will be 32% of the Europe's total population by 2050
- **USA Figure:** By 2050 more than 88.5 million people aged 65 and older.
- **Loneliness** and **social isolation** are already problems for many seniors and are even linked to cognitive decline and a higher death rate.
- With the population of seniors expected to rise, many worry that experiences of loneliness will increase, especially if access to care is even more limited.

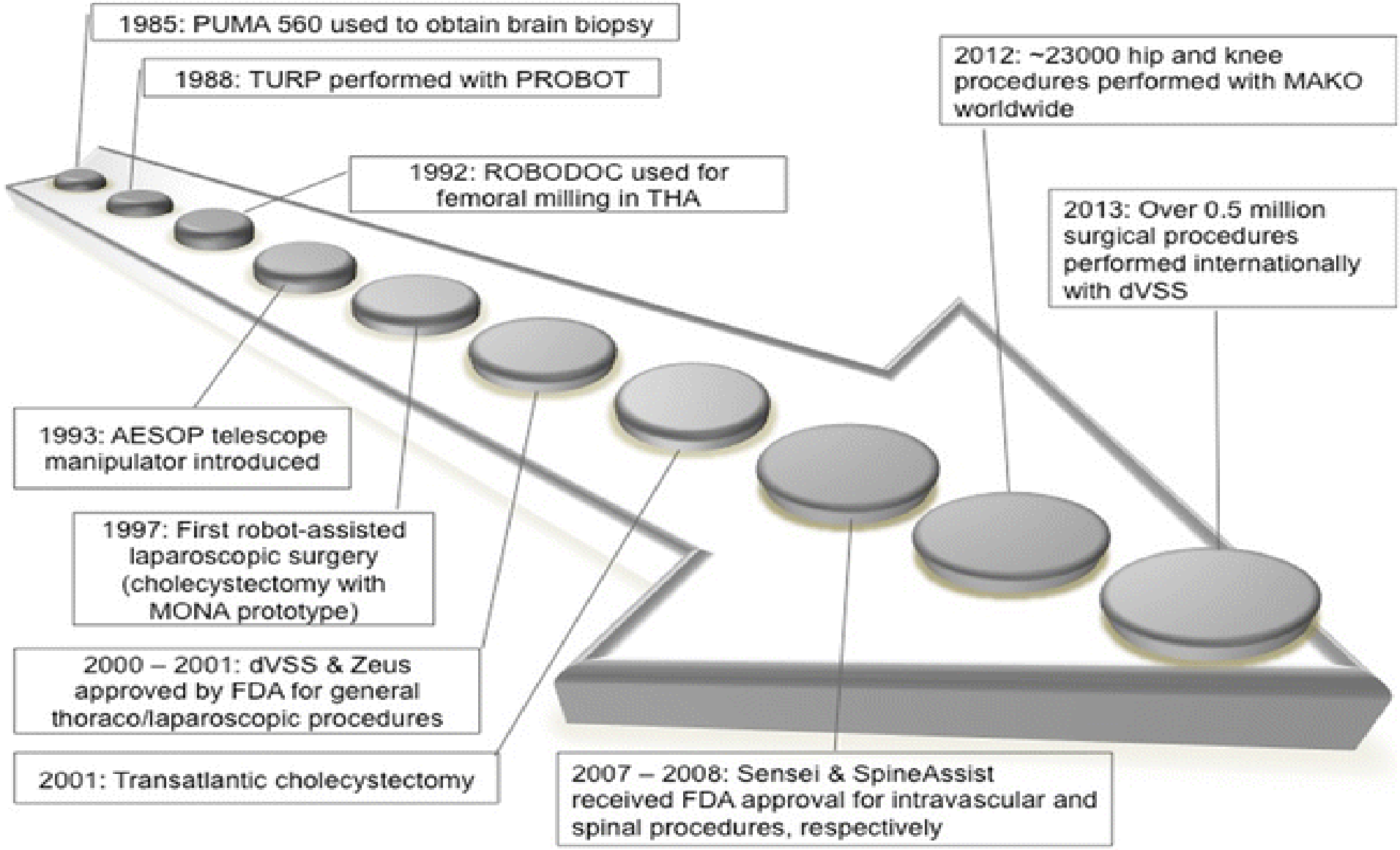
Robot on the Surgery

What is Robotic Surgery and Why??



Reference: Global Industry Analysts, Inc., USA

Robotic Surgery Timeline



Reference: link.springer.com/article/10.1007/s00464-016-4752-x

Types of Surgical Robot

1

Supervisory-controlled Systems

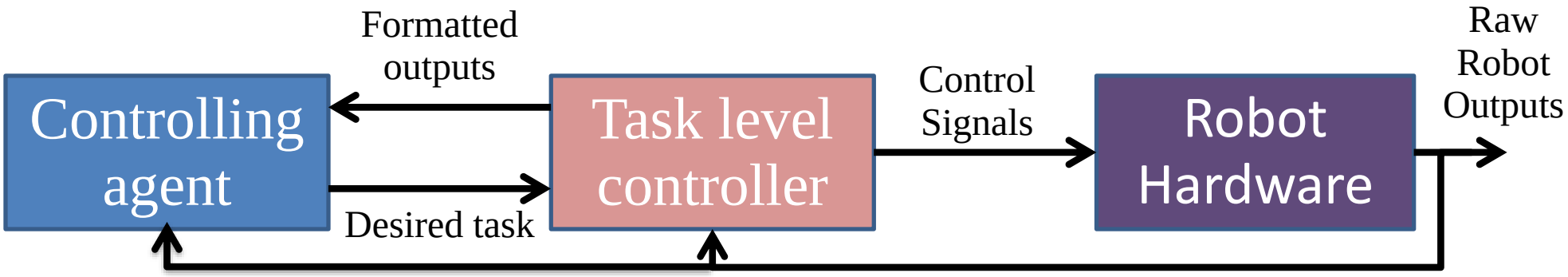
2

Tele surgical systems

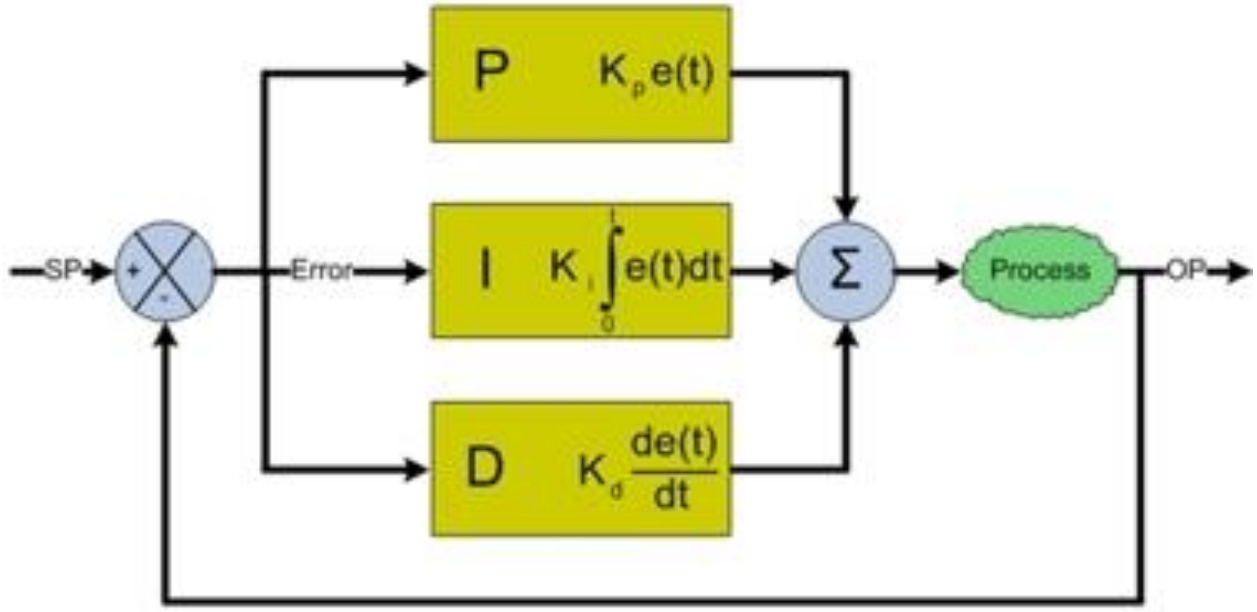
3

Shared-control systems

Supervisory- controlled Systems

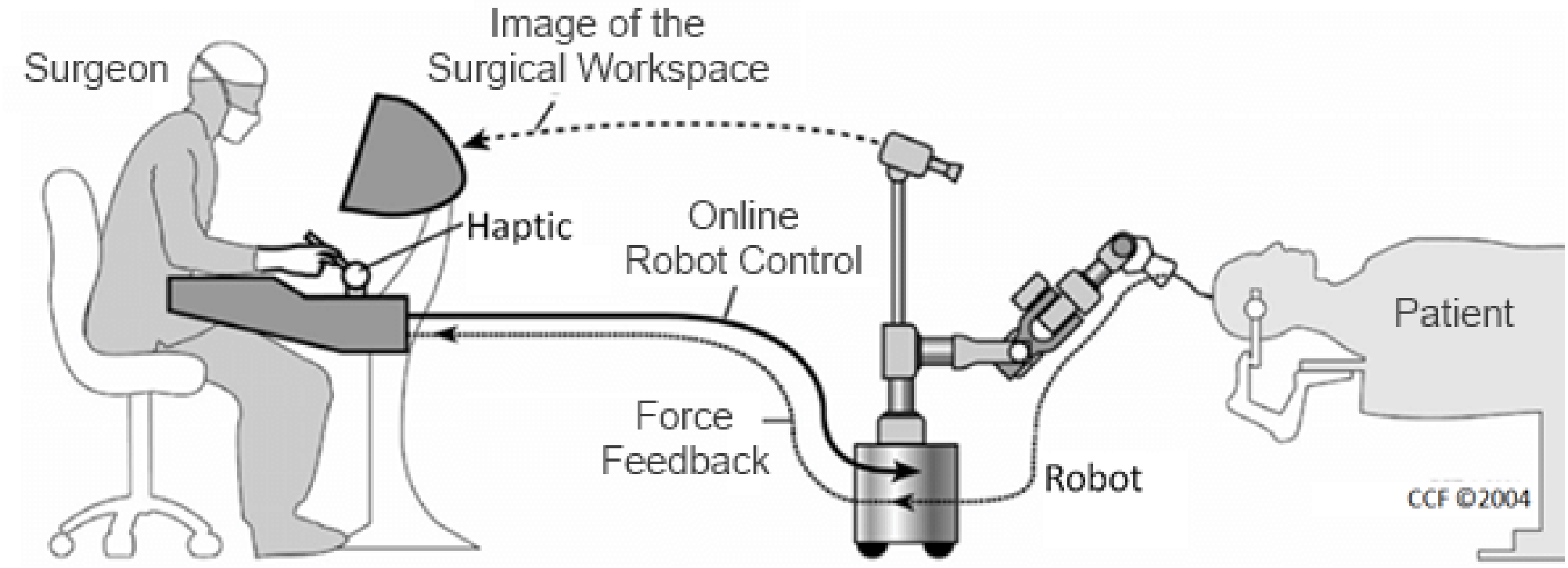


Generalized block diagram of Supervisory- controlled Systems



Generalized block diagram of PID controller

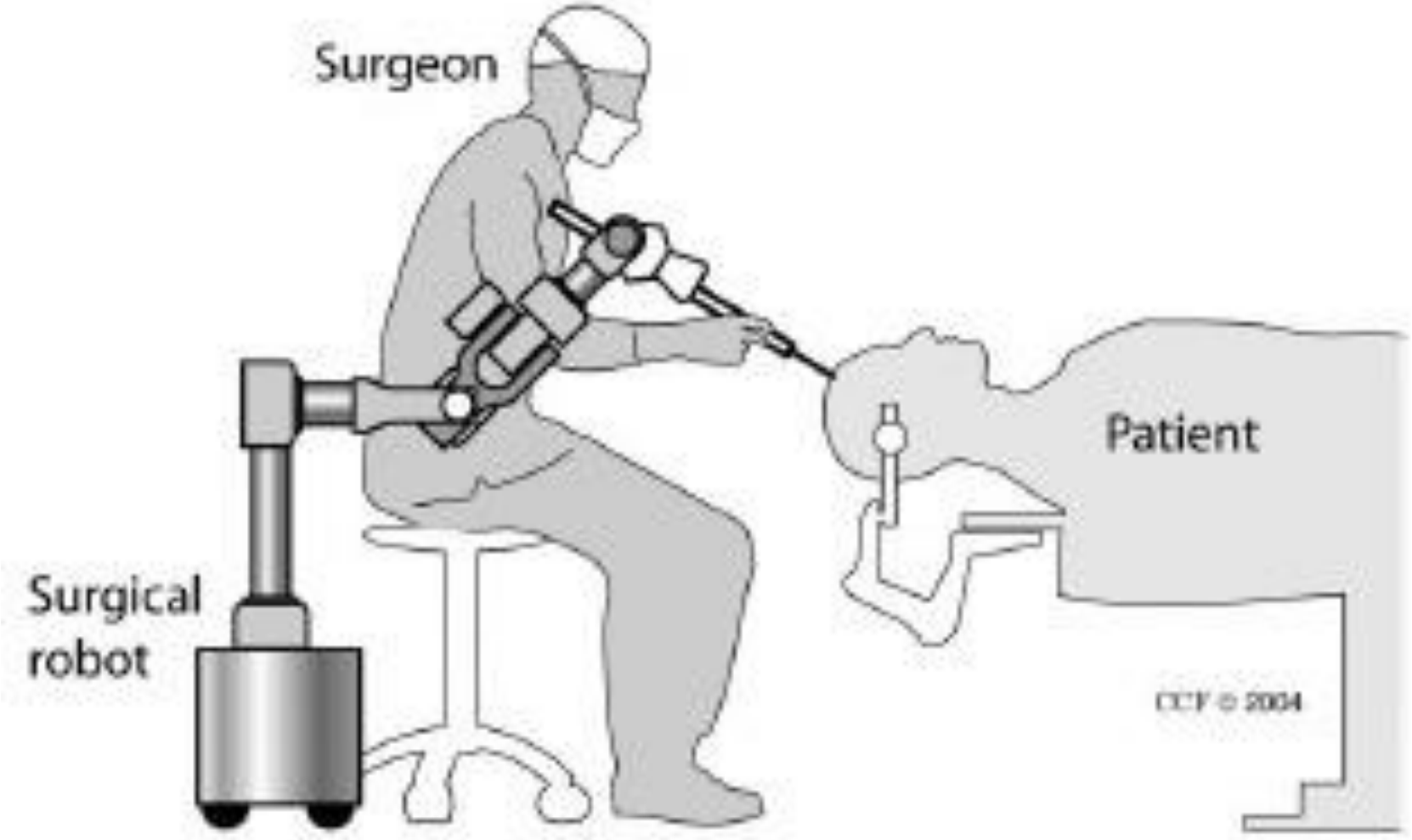
Tele surgical systems



Generalized block diagram of tele surgical systems

Reference: E. Bauzano et. al. "*Planning Automatic Surgical Tasks for a Robot Assistant*".

Shared-control systems



Generalized block diagram of Shared-control systems

Reference: wiki.tum.de/display/btt/Robotics

Advantages of Robotic Surgery

- Less scarring
- Faster recovery time
- Tiny incisions
- 0% transfusion rate
- Shorter catheter time
- Immediate urinary control
- Less post operative pain

Disadvantages of Robotic Surgery

- The question of safety
- Highly technical
- The cost

References

- Wendy Moyle et al., Exploring the Effect of Companion Robots on Emotional Expression in Older Adults with Dementia: A Pilot Randomized Controlled Trial.
- The Independent. (2019). *How robot carers could be the future for lonely elderly people*. [online] Available at: https://www.independent.co.uk/life-style/gadgets-and-tech/features/robot-carer-elderly-people-loneliness-ageing-population-care-homes-a8659801.html [Accessed 13 Jan. 2019].