

FIRE ROBOT

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CHALLENGES

- **NAVIGATION:** how it will be the motion of the robot on the ceiling avoiding lamps, walls, projector, etc. The robot must be able to navigate without any human assistance.
- **SENSING:** the robot needs some way to determine the position of the fire, the walls, etc.
- **FIRE FIGHTING-ARM:** the fire must be extinguished. The ceilbot must have a tool for extinguishing the flame.
- **REMOTE CONTROL:** It also must be able to be controlled by human.
- **TAKING PICTURES**
- **SOUND SIGNAL-STOP BUTTON**
- **SENDING INFORMATION TO FIRE STATION**

ENVIRONMENT



NAVIGATION AND MOVING

- VACUUM:
 - Charging-parking
 - Advantages:
 - ✓ Total navigation
 - ✓ Valid for many kinds of ceilings
 - Disadvantages:
 - ✓ A lot of energy is required in the navigation (motion + weight)
 - ✓ Failure of energy makes the robot fall down
 - ✓ Noise
- Example:
<http://www.youtube.com/watch?v=aXm6kKCNJ5g>
- Decision: too much energy + dangerous → **NO**

NAVIGATION AND MOVING

- PERMANENT MAGNET:

- Advantages:

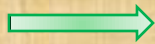
- ✓ Total navigation

- Disadvantages:

- ✓ Failure of energy makes the robot fall down

- ✓ Energy required: motion + weight

- ✓ Special ceiling

- ✓ Fire heating the ceiling  heating the robot

- Example:

http://www.youtube.com/watch?v=fVs_a-PKjws

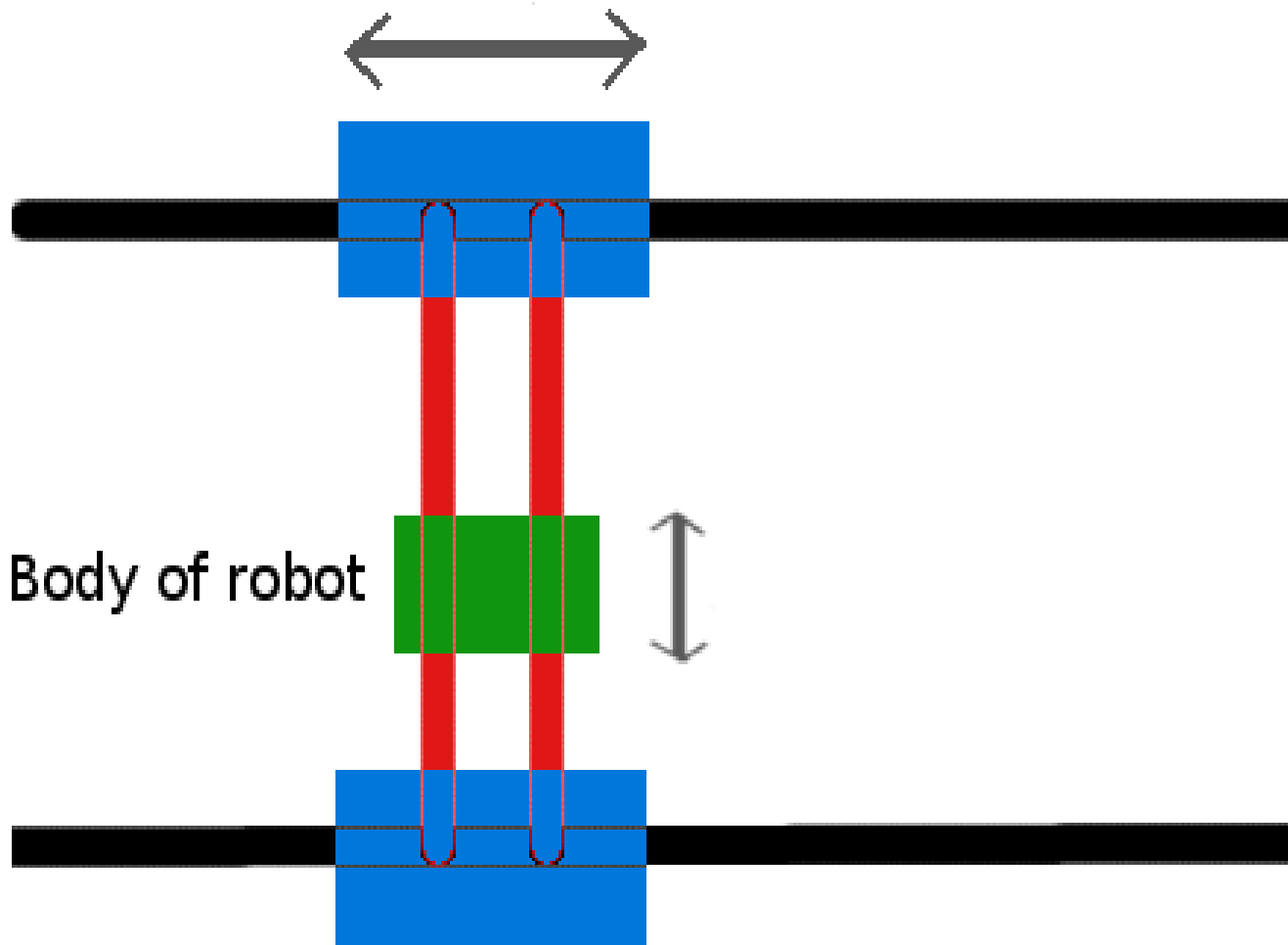
- Decision: special ceiling + dangerous  **NO**

NAVIGATION AND MOVING

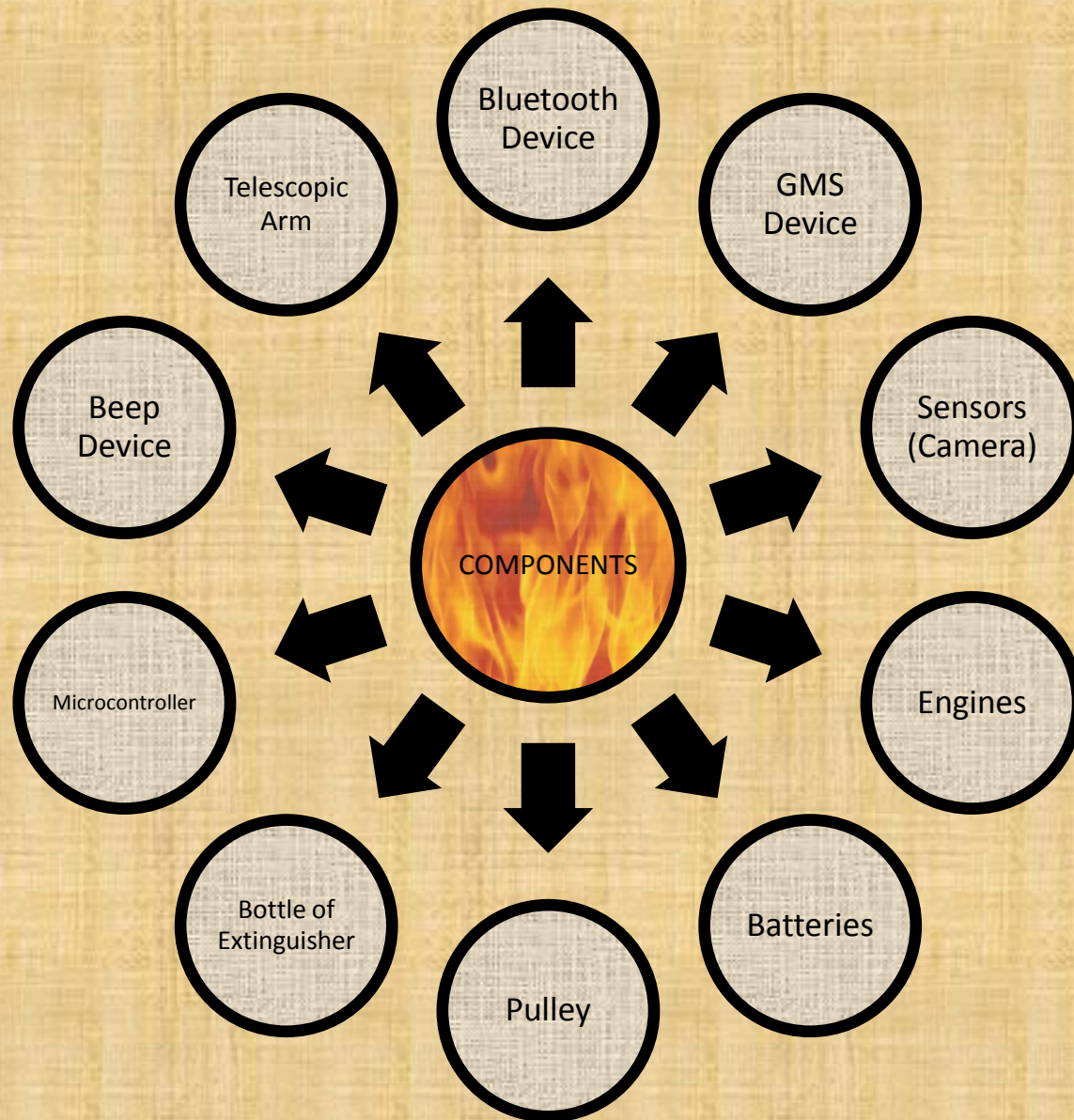
- RAIL:
 - Advantages:
 - ✓ Energy only for motion (not weight)
 - Disadvantages:
 - ✓ Limited navigation
 - ✓ Necessary to add rails
- Decision: add rail + limited navigation → **NO**

NAVIGATION AND MOVING

- BEAMS:
 - Advantages:
 - ✓ Total navigation
 - ✓ Energy only for motion (not weight)
 - Disadvantages:
 - ✓ Special structure
- Decision: total navigation + not too much energy + not build a new ceiling → YES

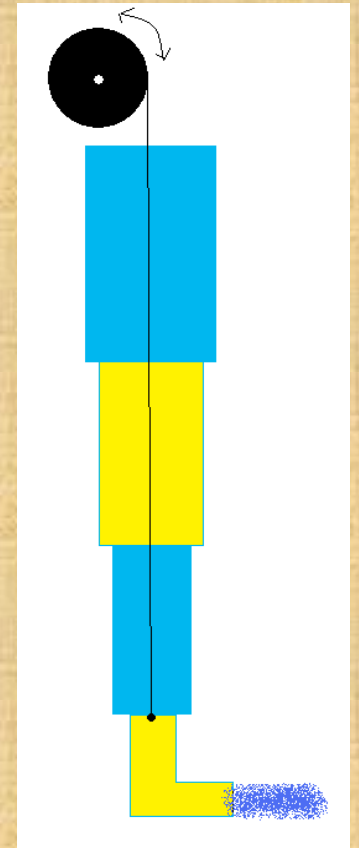


Body of robot

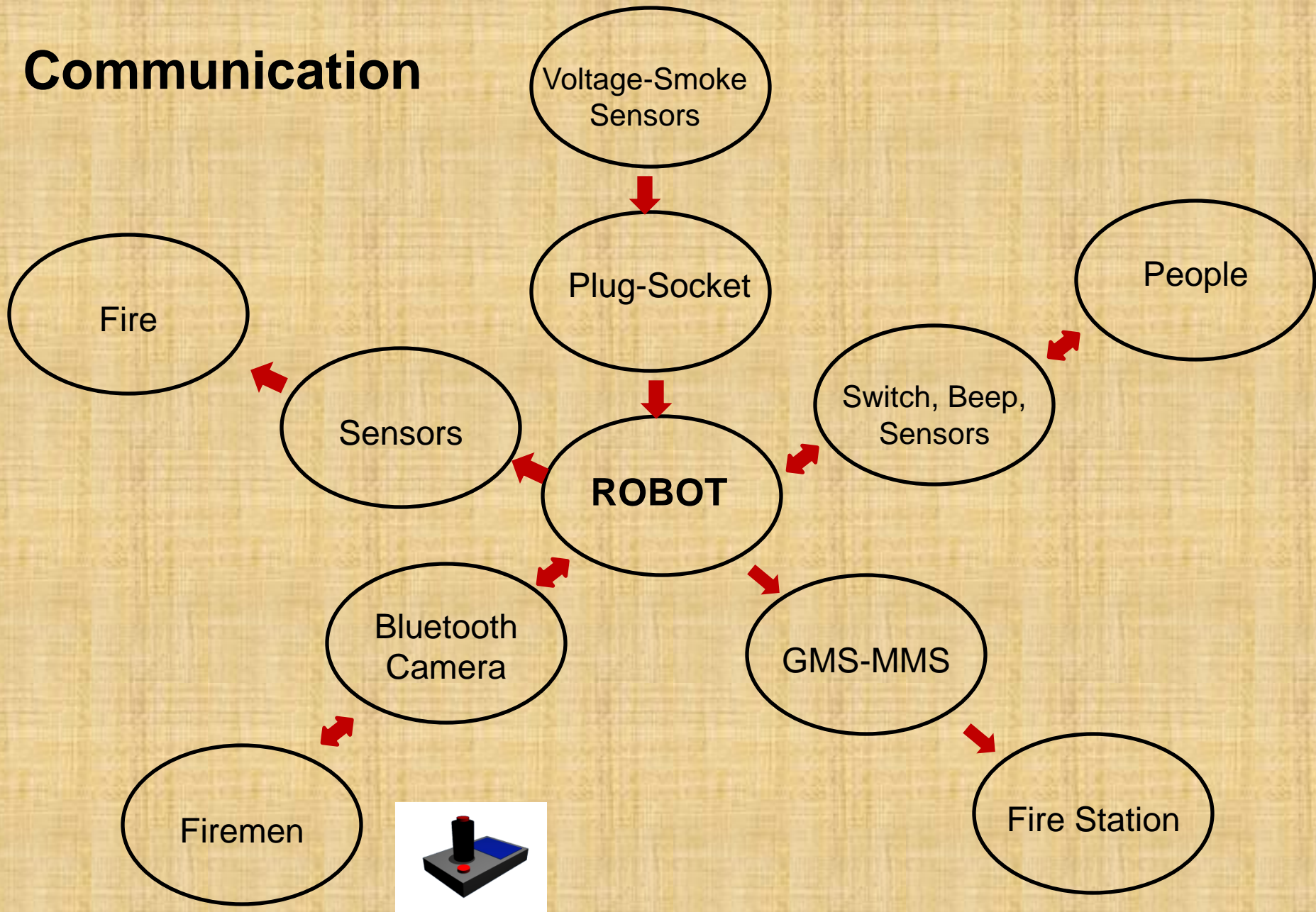


ARM

- Moving up-down and turning
- Smoke and heat sensor
- Infrared Sensors
- Gradient algorithm for estimating the source of the flame



Communication



POWER SYSTEM

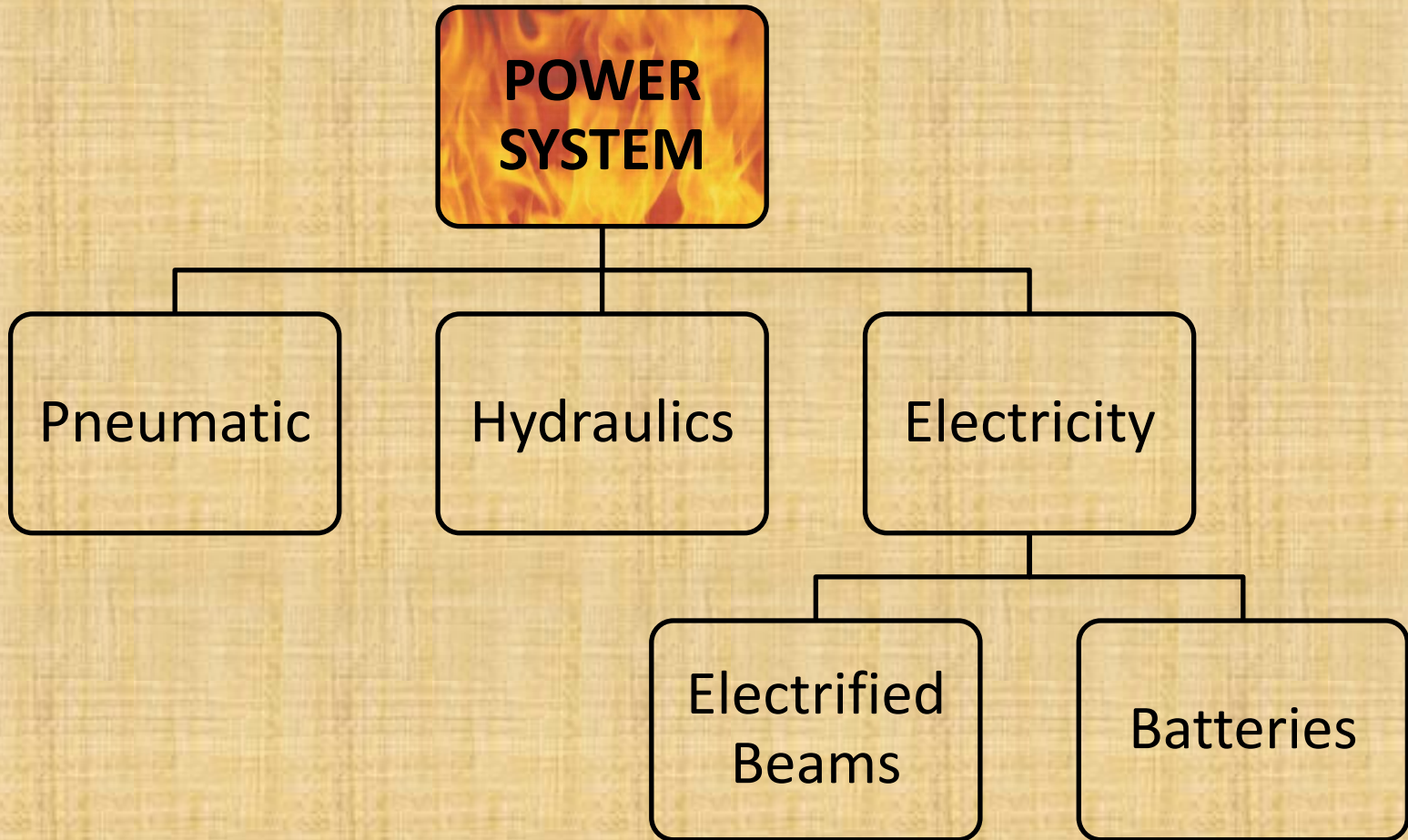
Pneumatic

Hydraulics

Electricity

Electrified
Beams

Batteries



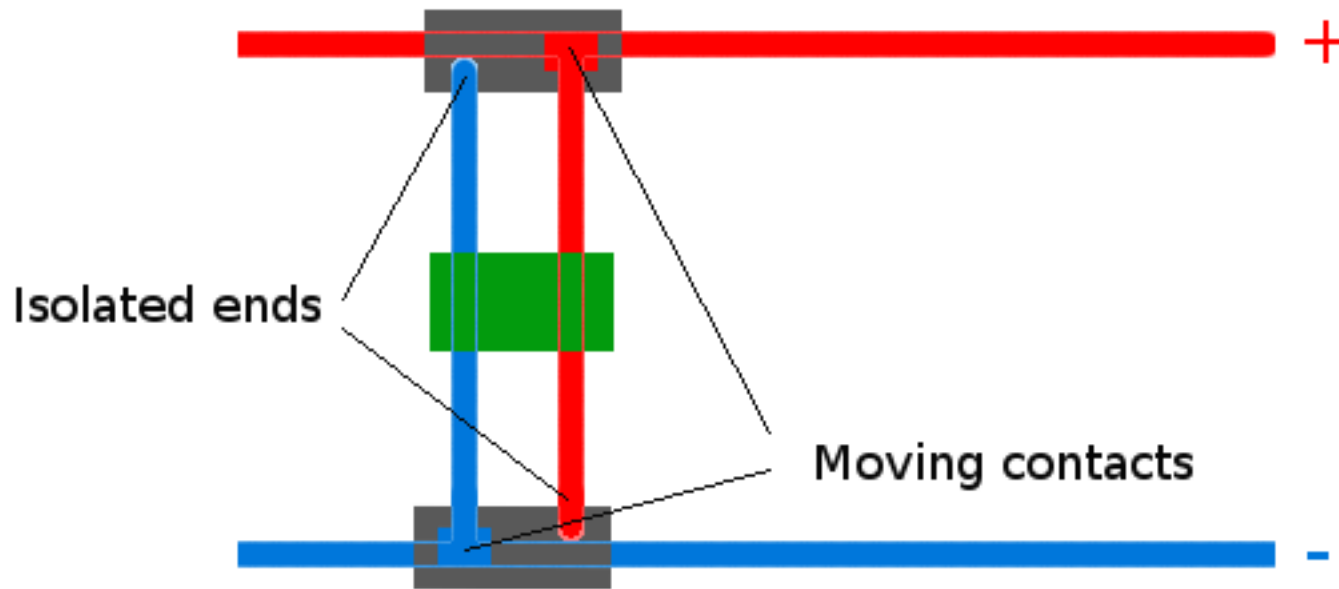
PNEUMATIC

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"><li>-Air → easily collected and abundant (Clean energy)<li>-Actuators work in easily adjustable and reasonable high velocities<li>-Overloads → no dangerous situations or damage permanently the equipments<li>-Immediate changes of direction	<ul style="list-style-type: none"><li>-Big circuits → significant energy losses<li>-Special installations to recoup the air<li>-Usually pressures → don't enable apply great forces<li>-Noise → download air to the atmosphere

HYDRAULICS

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none">-High levels of forces or torques-Oil → easily recoverable-Working velocity → easily adjustable-Simple protection against overloads.- Swift changes of direction.	<ul style="list-style-type: none">-The fluid is more expensive-L osses of load-Technical personal for maintenance- Fluid very sensible to the contamination

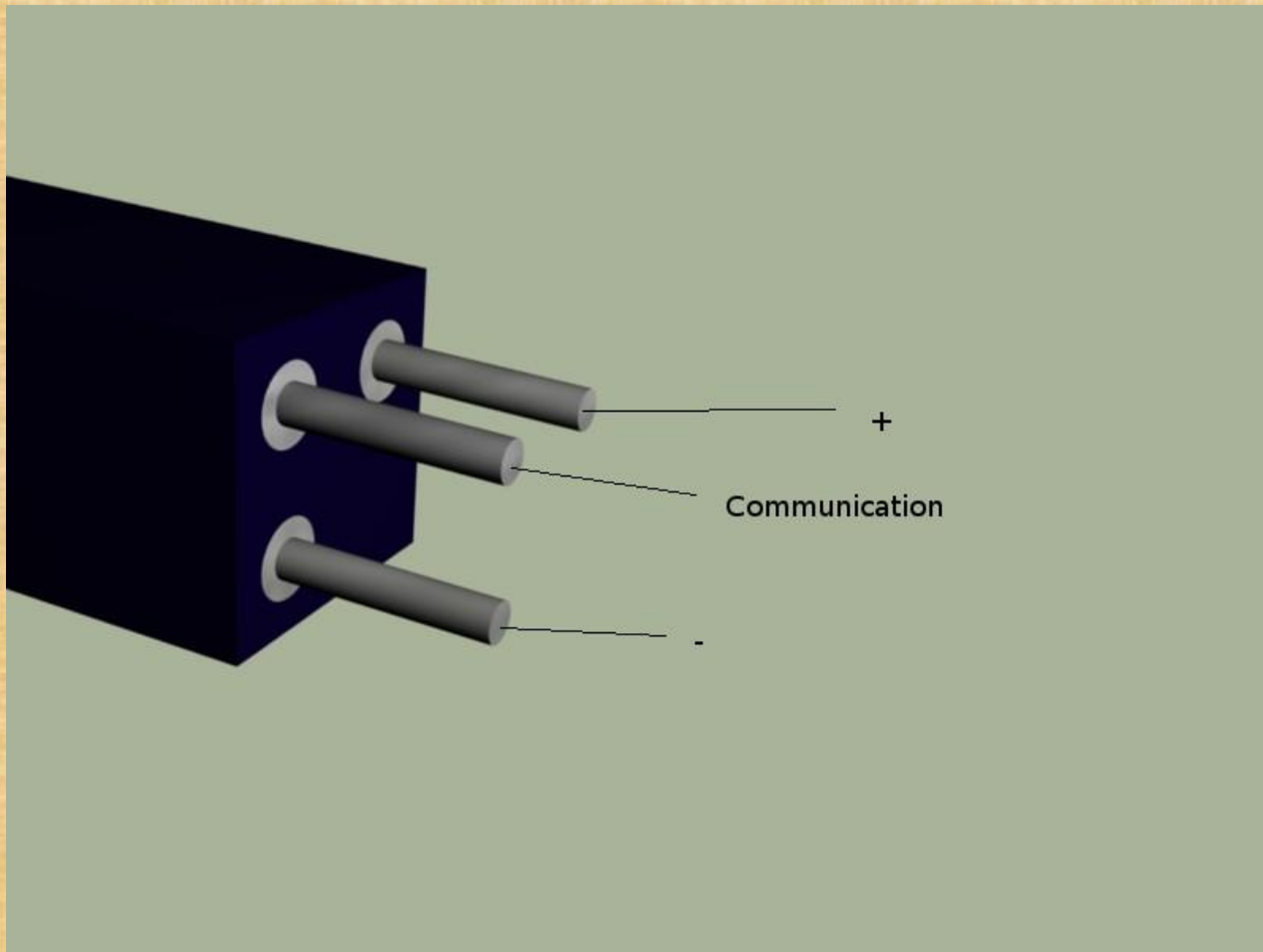
ELECTRICITY: ELECTRIFIED BEAMS



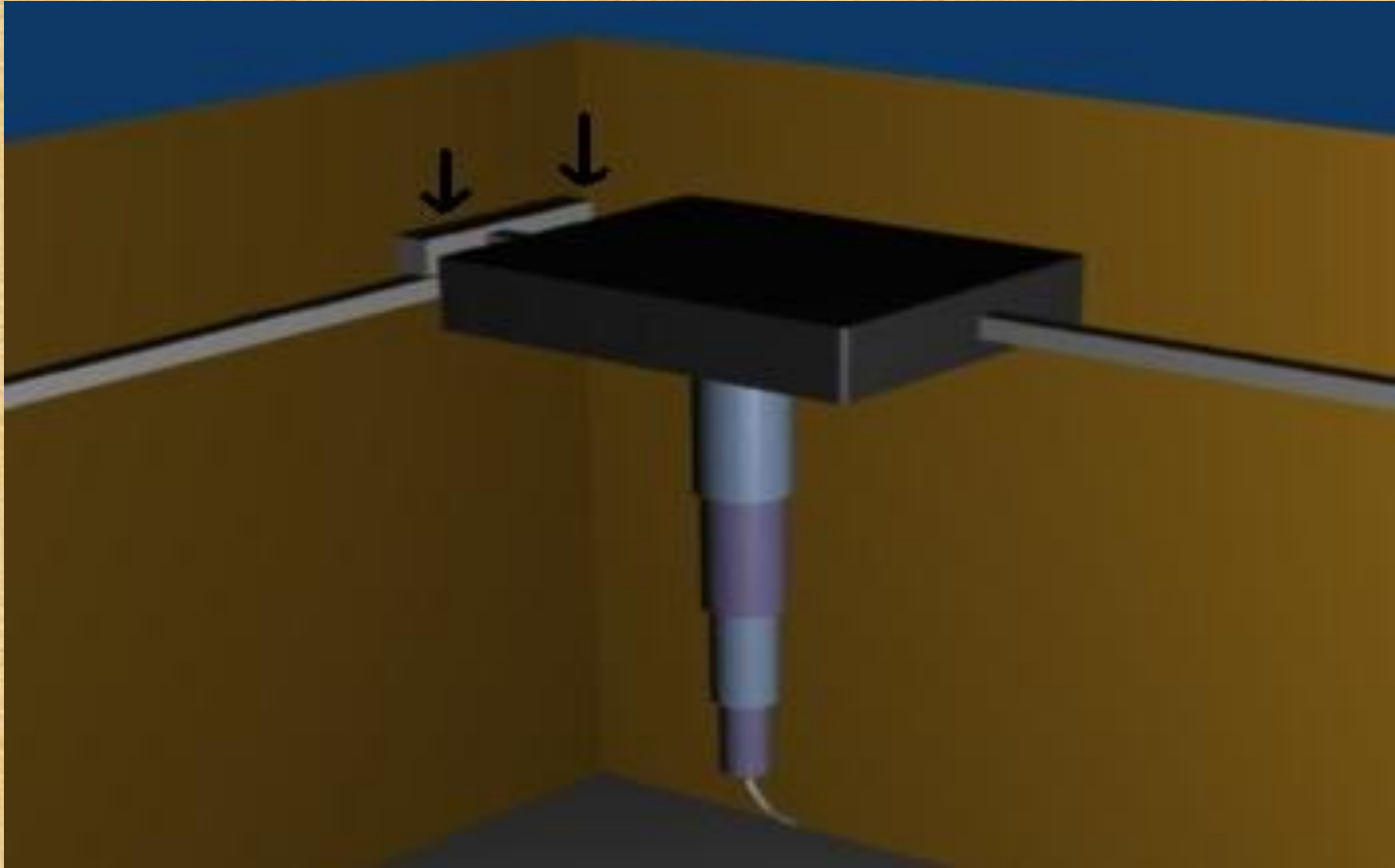
ELECTRICITY: ELECTRIFIED BEAMS

- In any situation, it maybe would be the best option.
- The fire can be produced by a short circuit or perhaps the flames can destroy the wires cutting off the electricity and making useless the system → NO

ELECTRICITY: BATTERIES



ELECTRICITY: BATTERIES



SELECTION OF EXTINGUISHER



