Gedächtnisprotokoll Neuromechanics SS20

1 Stunde Zeit. War insgesamt ziemlich schwierig, nachdem er in der Vorlesung immer gesagt hatte, dass vermutlich keiner von uns Probleme mit der Klausur haben wird.

Teil 1: ca. 10 Multiple Choice-Fragen. Immer 04 Antwortmöglichkeiten, es war immer nur 1 Antwort richtig.

1. How is the membrane potential of excitable cells in resting condition maintained?
   a. Electric gradient
   b. chemical gradient
   c. Sodium-Potassium pump
   d. …

2. For a signal with frequencies from 4 to 250 Hz, which sampling frequency should be chosen?
   a. Fs >250 Hz
   b. Fs >= 250 Hz
   c. Fs > 500 Hz
   d. Fs >= 500 Hz

3. When recording SSVEPs, where should you place the electrodes?
   a. Frontal lobe
   b. Occipital lobe
   c. Temporal lobe
   d. Parietal lobe

4. From which part of the spinal cord do sensory nerves exit?
   a. Ventral horn
   b. dorsal horn
   c. pyramidal tract
   d. …

5. Which structures of the nervous system can produce regular/repeating signals by themselves?
   a. Central pattern generators
   b. Rubrospinal tract
   c. …

6. Information about what cannot be derived from muscle fiber conduction velocity measurements?
   a. Fatigue
   b. Direction of conductance
   c. …

7. What is an effective strategy for reducing/removing movement related artifacts in an EMG signal?
   a. High pass filtering
   b. …

8. What decides whether a neuron is excitatory or inhibitory?
   a. The neuron’s neurotransmitters
   b. …

9. Which football club is the best in the world?
   a. FC Schalke 04 (only possible and obviously the only correct answer)

10. ...

Teil 2: Open Questions. Es gab 3 Teile mit jeweils der Beschreibung eines Szenarios und ca. 6 Fragen zu jedem Szenario. Die Fragen waren sehr offen gestellt, sodass man oft nicht wusste, was genau gemeint war oder wie ausführlich man jetzt etwas beantworten sollte. Unter den Fragen stand immer: „Motivate your answers “.

Scenario 1: Motion Tracking

- Describe optical and non-optical technologies for motion tracking. Compare them regarding to requirements (room, costs, requirements …)
- Explain a technology for marker based optical motion tracking
- How can ground reaction forces be measured?
- Describe how one can estimate internal joint forces from measurements of ground reaction forces.
- Is there a unique solution for the inner joint forces? Explain by the example of a specific motion (e.g. elbow)
- How do we compare different subjects?
- …

Scenario 2: Muscle activation with Dynanometer. You recruited some healthy and young people for a muscle fatigue study.

- Describe how a muscle generates force.
- Describe how an experiment should be designed (e.g. regarding sequence of tasks) in order to obtain comparable and reasonable results
- What are mechanical manifestations of fatigue?
- How can fatigue be observed in the EMG signal?
- Which can be observed first: Mechanical or electrophysiological manifestations of fatigue?
- …

Scenario 3: Spinal Cord injury. Imagine a tetraplegic patient which has only motory/sensory deficits but is healthy in all other aspects (e.g. cognition)

- At which level of the spinal cord should the lesion be (roughly)?
- Is there a therapy for reducing muscle atrophy of the patient?
- On which kind of rehabilitation should a therapy focus? Restoration, Compensation, Assistance and/ or Replacement?
- Describe other technologies which could be useful for the patient.
- Describe the short-term and long-term consequences of this technology.
- ...