EGN4950

General engineering Design 1

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Module 1 Engineering Challenges

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Advance Personalized Learning

<http://www.engineeringchallenges.org/challenges/learning.aspx>

1. describe the problem

Throughout the educational system, teaching has traditionally followed a one-size-fits-all approach to learning, with a single set of instructions provided identically to everybody in each class, regardless of differences in aptitude or interest. Similar inflexibility has persisted in adult education programs that ignore differences in age, cultural background, occupation, and level of motivation. Every student is different, they have different learning speed and way. One-size-fits-all teaching is not fit all students. Learning is no long memorizing peace of information.

1. Significance of Problem

In recent years, a growing appreciation of individual preferences and aptitudes has led toward more “personalized learning,” in which instruction is tailored to a student’s individual needs. Personal learning approaches range from modules that students can master at their own pace to computer programs designed to match the way it presents content with a learner’s personality. We can design brain wave sensing headphone.

Find the richness of the student’s background and use that to courage student engaged learning forward path. How to tap the richness of brain and develop a way to searching information and solver problem.

1. Solution:

Ongoing research in neuroscience is providing new insights into the intricacies of neural processes underlying learning, offering clues to further refine individualized instruction. Mastery of these processes in advanced software could make learning more reliable.

* The brain Memory already contain archives, the trick is how to access to the archives .
* Use electroencephalography (EEG) THESE SENSORS pick up electrical signals from brain waves.

Itchy, fidgety , focus, did not have a good contact, effects the signal.

* Some learners are highly self-motivated and self-driven, learning best by exploring a realm of knowledge on their own or at least with very little guidance. Our device can track student’s brain waves.
* Students can fill form what is his personize way to learn and happy. So, our device can build module to stimulate his richness background. In order to engage his personalized learning path forward.
* The device can send signal to instructor or paraments . students in classroom brain wave results.
* Collect all the data ,instructor can adjust his or her teaching way.

1. Hardware

Brain wave sensing headphone.

Three electronic. Two behind the ears. One on the forehead.

Electroencephalography (EEG)

1. Software

neuroscientist and education system software

User Interface and Data Communications

1. Reference

Canales, A. et al. 2007. Adaptive and intelligent Web-based education system: Towards an integral architecture and framework. Expert Systems with Applications 33(4): 1076-1089. DOI: 10.1016/j.eswa.2006.08.034

Hsu, M.H. 2008. A personalized English learning recommender system for ESL students. Expert Systems with Applications 34(1): 683-688.

Huang, M.J. et al. 2007. Constructing a personalized e-learning system based on genetic algorithm and case-based reasoning approach. Expert Systems with Applications 33(3): 551-564. DOI: 10.1016/j.eswa.2006.05.019

Liu, J., C.K. Wong, and K.K. Hui. 2003. An Adaptive User Interface Based on Personalized Learning. IEEE Intelligent Systems 18(2): 52-57. DOI: 10.1109/MIS.2003.1193657

Margaret Martinez, M. 2002. What is Personalized Learning? The e Learning Developers’ Journal May 7: 1-7.

Artificial Kidney

1. <https://www.challenge.gov/?challenge=artificial-kidney-prize-phase-2>
2. Problem Description:

The uremic syndrome is the prototype of a slowly progressive endogenous intoxication when a detoxifying organ (in this case the kidney) fails. It is characterized by the gradual retention of a host of metabolites, which is in part corrected by dialysis, allowing survival with an acceptable quality of life. Adequacy of dialysis is estimated currently from the concentration of urea, which is used as a marker molecule. The problem is that urea is not really toxic by itself. People living with kidney failure face to replace kidney,

The organ is shortage. Some 660,000 Americans currently are living with renal failure, and 100,000 are waiting for a kidney transplant, according to statistics from the National Kidney Foundation. In addition, approximately 100,000 Americans begin dialysis each year, and one-in-five of them will die within a year, Dr. Kurtz says. According to some authors, part of the natural renal function could be replaced by cultured renal tubular cells, which are brought in contact with the blood of the patients.

1. Significance of the Problem:

People living with kidney failure can soon look forward to a future without dialysis. Or an endless wait for a transplant organ. Combining continuous treatment with total mobility, the implantable bioartificial kidney will give patients back their health, freedom, and quality life. The compact device will replicate many functions of healthy kidneys and will not require immunosuppression drugs. The bioartificial kidney combines a mechanical hemofilter.

1. Solution:

The bioartificial kidney combines a mechanical hemofilter. To remove toxins from blood and bioreactor containing engineered renal tubule cells.

To maintain water volume, electrolyte balance, and metabolic functions highly efficient membranes.

Constructed from semiconductor silicon waters enable filtration without requiring pumps or electrical power while protecting the renal cells from rejection by the patient’s immune system.

The biocompatible device attached to the circulatory system and removes toxins to the bladder as waste.

After decade engineering development. Hemofilter bioreactor components , cleanroom microfabrication processes.

High-quality silicon membranes, Tissue culture protocols have also been optimized.

It let reproducibly grow renal tubule cells and maintain their function .

1. Hardware:

Hemofilter and bioreactor components.

Function: the hemofilter and bioreactor components were then connected to create bioartificial kidney.

Hemofilter operated under blood pressure alone. Without systemic anticoagulation, while the renal cells in the bioreactor remained alive and healthy without immunosuppression.

Clinical devices

Function: that can demonstrate sustained treatment of kidney failure.

Microprocessor.

Sensor

Nanofiltration module, which is also a filter but has the properties of preventing glucose excretion and allowing the permeation of urea, electrolytes and water

Electrode ionization modules, which use an electric current to drive the transport of specific electrolytes from one solution to another

1. Software:

Build kidney monitor software

User Interface and Data Communications

1. Reference

Link:

<https://pharmacy.ucsf.edu/topics-expertise/implantable-bioartificial-kidney>

UCSF’s artificial kidney project wins major award, now one step closer to potentially changing lives

UCLA US kidney Research Corp

<https://youtu.be/NShv90BFbHM>