

DISPERSION SIMULATIONS FOR RLV TRAJECTORY GUIDANCE

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One of the challenges in designing the new Reusable Launch Vehicle (RLV) is the development of a guidance algorithm that would control its entry trajectory. The objective of this research is to test an entry guidance algorithm developed in the UC Irvine Flight Dynamics and Control Laboratory. By simulating entry for a variety of initial conditions, the ability of the guidance algorithm to handle such targeting errors is assessed. The data obtained is essential for the achievement of better entry guidance algorithms, which will result in total control of the RLV's flight path.

TAXONOMY OF CASES IN ENGINEERING ETHICS

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Engineering ethics is a field which looks at the moral and ethical implications of an engineers' work. Since products are being produced faster, and more advanced at an alarming rate, sometimes the damage the product can cause is either not examined or knowingly overlooked in the process of repaying a quick return. By researching in depth the details of engineering ethics cases that have been reported, I am able to spot trends in reoccurring cases. In doing this, I can then analyze further what can be done to prevent such cases from reoccurring and thereby protect the safety of the consumer and workers alike. The final product of my research will be a website, which incorporates a taxonomy, to be constructed using HTML, and that is available for all to view. The purpose of doing this is to increase awareness of ethical issues that arise in the practice of engineering, and ultimately to promote human safety.

ANTI-PARASITE IMMUNE RESPONSES INFLUENCE GROWTH OF THE PARASITE *SCHISTOSOMA MANSONI*

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An immune response in the liver is necessary for intrahepatic development of the trematode parasite *Schistosoma mansoni*. *S. mansoni* recovered from recombination activating gene (RAG)-1^{-/-} mice 6 weeks post infection are small and poorly developed compared to those recovered from wild type mice at the same time point. We hypothesize that differences in parasite cell division underlie the observable differences in parasite phenotype. To test this hypothesis, we are using 5-bromo-2'-deoxyuridine (BrdU), a thymidine analog, to identify dividing cells in parasites from wild type and RAG-1^{-/-} mice.

In addition, the liver is a site of extramedullary hematopoiesis and this may be an important component of the anti-parasite response. The BrdU-labeling approach is therefore also being employed to identify and characterize dividing lymphocytes and their precursors in the liver. Preliminary results show that foci of dividing cells can be identified in the livers of infected mice by anti-BrdU immunohistochemistry. Flow cytometric analysis indicates that dividing lymphocytes are a component of this proliferative response.

ASSESSING COLORECTAL CANCER SCREENING BARRIERS AMONG HIGH RISK LATINOS

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There is a significant decrease in the incidence of Colorectal Cancer (CRC) across different ethnic groups. This decline has been accredited in part to the new available screening methods. However, though recent studies have investigated whether the new screening methods are the cause of this decline, there are few studies investigating why the Latino

population does not share a consistent decline in CRC incidence. We hypothesized that among the first-degree relatives (FDR) of CRC patients, those who failed to be screened must have more psychosocial and concrete barriers than those FDR who were screened. The present study wanted to investigate why the high-risk Latino population is being screened less frequently than other ethnic groups. Phone interviews that questioned first-degree relatives of CRC cases about their knowledge and attitudes toward CRC were conducted to evaluate this hypothesis. Most unscreened relatives had significantly less knowledge about CRC and screening methods than the screened group. These results support that the more screening barriers people have the less likely they are to be screened. In the future, we hope to use this information to create educational programs that will educate the high risk Latino population about CRC and its risks.

OPTIMIZATION OF THE CONTROL SYSTEM HARDWARE OF A MODIFIED CONTINUOUSLY VARIABLE TRANSMISSION

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Coulomb is the name of a 1994 Mercury Sable, which was converted into a hybrid electric vehicle at UC Davis Hybrid Electric Vehicle (HEV) Center. The car, from the 1998-1999 UC Davis Futurecar project, employs a modified continuously variable transmission (CVT) that promises to perform at a higher efficiency than conventional geared automobile transmissions. Experimental investigation of the CVT servo-hydraulic control system will allow further optimization of the whole powertrain, by measuring the power draw of the CVT and the efficiency of the system. Optimized efficiency would result in a longer driving range for the electric battery pack, and better fuel economy for the gasoline engine. Testing will measure the power draw of components at steady state and over a drive cycle. These analyses will be accomplished by the aid of maps of CVT controller efficiency and energy use. Effectiveness of shift servo pump and CVT hydraulic losses will be calculated as well. Data will be collected using acquisition equipment that *Coulomb* currently has, with the addition of a few more sensors to the CVT.

UNSAFE BEACHES DUE TO HIGH LEVELS OF BACTERIA

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Fecal indicator bacteria concentrations are used to determine bathing water quality in California. In recent years, Huntington city beaches have experienced bad water quality, and have even been posted or closed because of high levels of fecal indicator bacteria. One possible source of the bacteria is urban runoff, which makes its way from street gutters to underground forebays and channels, which drain to the ocean. In this study, we look at the concentration of bacteria in waters from the forebays and channels which may drain to Huntington state beaches. This area is known as the Talbert watershed, and includes portions of Huntington Beach and Fountain Valley. Dailey water samples were collected from fifteen locations within the Talbert watershed for 21 days. At the lab, the waters were analyzed for physical properties (pH, salinity, and turbidity), and fecal indicator bacteria concentration (including Total Coliform, Fecal Coliform, and Enterococci). By analyzing time series of the bacteria concentration at the sites, we can distinguish whether changes in bacteria concentration occur because of local or global events. This study will lead to a better understanding of the factors that influence impounded water quality.

EXPRESSION OF ENDOGENOUS BRAIN NEUROTROPHIC FACTORS

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The hypothesis being tested is that increases in expression of endogenous brain neurotrophic factors can facilitate neuronal development and viability of neurons in the central nervous system. To test this hypothesis, studies will examine the ability of various manipulations (e.g., drug treatments) to increase neurotrophic factor gene expression by brain neurons and then will determine if these

increases in expression support neuronal development and health. Initially, studies will focus on the effects of drugs on mRNA content using *in situ* hybridization techniques. My role will be to conduct *in situ* hybridization procedures and to evaluate labeling densities using a film-image analysis system.

NEURONAL DIFFERENTIATION IN DROSOPHILA: DUE TO A MUTATION IN THE SIGNALING LIGAND DPP

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Studies that have been done on a number of species, have indicated that genes in the TGF-beta superfamily are important for early embryonic differentiation. In my experimentation, I used mutants that are also part of the TGF-beta receptors. The DPP mutant strain that I will studied, causes ventrization of the fly embryo, which results in an overproduction of neurons. I predicted that cultures prepared from DPP mutants will have more neurons than seen in wildtype cultures.

IDENTIFYING SELECTED CHLORINATED GASES IN EAST ASIA DURING NASA'S TRACE-P PROJECT DC-8 FLIGHT 12, 13 and 15*

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East Asia's rapid industrial growth has lead to a substantial increase of fossil fuel combustion and other pollutants over the past decade and is expected to continue increasing as Asia develops. NASA's TRACE-P airborne project was designed to observe the time-dependent atmospheric impact due to the industrial growth. 1,2-dichloroethane (1,2-DCE), methyl chloride (CH₃Cl) and tetrachloroethylene (C₂Cl₄) gases are emitted during various Chinese industrial processes, thus they are good markers for identifying air masses imparted by Chinese emissions. Concentrations of these gases were determined from samples collected over parts of East Asia during NASA's TRACE-P DC-8 flights 12,13 and 15 (* flew on Flight 15).

Extra-Cellular Matrix in Regulating Myocyte Morphology on Silicon-Elastomers

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The structural organization of the cell and its interactions with the surrounding extra cellular matrix (ECM) is critical to the development of the muscle cell phenotype and contractile abilities. For a time now, people have been trying to see how these interactions occur in soft lithographic techniques. Soft lithographic methods use an elastomeric stamp or mold, prepared by casting pre-polymer liquid of an elastomer against a master that has a patterned structure, thus, only growing cells on the pattern on the elastomer. Moreover, the majority of cell types require substrate attachment for survival, growth, and maintenance of a differentiated phenotype. Therefore, in this study we will see how different ECM proteins, such as Fibronectin (FN) and different types of Collagen, produce different cell morphology and phenotype. The ability to generate patterns of proteins and cells on surfaces is important for biosensor technology for tissue engineering and for fundamental studies of cell biology. For example, tissue engineering may require that cells be placed in specific locations in order to create organized structures. This type of research may one-day pave the way for engineering cells and tissue for use in biosensors and other "hybrid" systems that combine living and non-living components, such as knee or hip replacements.

THE EFFECTS OF SIMULATED MICROGRAVITY AND ITS CONTRIBUTION TO VASCULAR HYPORESPONSIVENESS; THE ROLE OF SRC

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Simulated microgravity impairs vascular contractility. The specific objective of this project is to determine the effects of microgravity on Src Kinase. The Src protein is a critical signaling molecule in the tyrosine kinase pathway, leading to vascular contraction. Hindlimb unweighting (HU)

was used to simulate microgravity in male Wistar rats. When contraction was induced, HU arteries contracted markedly less than control. Control tissues treated with a Src inhibitor contracted less than non-treated control arteries, however, the presence or absence of a Src inhibitor had no effect on the HU tissues. This leads us to believe that hindlimb unweighting causes a down-regulation of Src, thereby reducing the efficiency of the tyrosine kinase pathway in inducing vasoconstriction. My specific role in this project will be to care for and administer the microgravity treatment for the live rats for 20 days each. After this period I will euthanize the animals, isolate and clean the arteries. To thoroughly investigate these findings, I will be performing tissue bath experiments, Src activity assays, and immunohistochemistry experiments.

WATER QUALITY CHARACTERISTICS OF IMPOUNDED WATER IN THE TALBERT WATERSHED

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Fecal indicator bacteria, which include Total Coliform, Fecal Coliform, and Enterococcus, are used to determine water quality throughout the world. The concentration of fecal indicator bacteria has been found to be elevated in forebays and channels in the Talbert watershed, located in Huntington Beach, California. Forebays and channels are a part of the urban drainage system and contain a mixture of ocean water and urban run-off. In this study, water samples from 15 sites in forebays and channels were collected daily and analyzed for physical parameters (salinity, pH, temperature, turbidity) and bacterial indicators. The concentration of bacteria was determined using Colilert-18 and Enterolert tests. The purpose of this study is to find a correlation between the bacteria concentration and the physical chemistry of the impounded water. We expect the turbidity to be proportional to the bacteria concentration. However, we expect an inverse correlation between the salinity and bacterial concentrations of the samples. Inland stations will have lower salinity and thus higher bacterial levels, while shoreward stations will have higher salinity levels and lower bacterial levels. These correlations may provide simpler ways to determine the quality of impounded waters in urban areas.