Task Book Report Generated on: 04/25/2024

Priser: Disease Disease Program Research Program Research Research Program	Fiscal Year:	FY 2010	Task Last Updated:	FY 05/21/2010
Division Name:   Human Research   Program/Discipline:   NSBRI   Program/Discipline:   NSBRI   Program/Discipline:   NSBRI   Neurobehavioral and Psychosocial Factors Team   Fetheror:   Yes   Yes	PI Name:	Dinges, David F. Ph.D.		
Program/Discipline:   NSBRI   Program/Discipline:   SBRI-Neurobehavioral and Psychosocial Factors Team   SBRI-Neurobehavioral Itealth & Performance (archival in 2017)   SBRI-Neurobehavioral Itealth & Performance (archival in 2017)   SBRI-Neurobehavioral Itealth & Performance (archival in 2017)   SBRI-Neurobehavioral Conditions and Psychiatric Disorders   SBRI-Neurobehavioral Conditions   SBRI-N	Project Title:	Optical Computer Recognition of Stress, Affect and Fatigue	during Performance in Space	eflight
Program/Discipline:         NSBRI - Neurobehavioral and Psychosocial Factors Team           Program/Discipline:         SSBRI - Neurobehavioral and Psychosocial Factors Team           Joint Agency Name:         TechPort:         Yes           Human Research Program Elements:         (1) BHP-Behavioral Health & Performance (archival in 2017)           Human Research Program Risks:         (1) BMed-Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders           Space Biology Element:         None           Space Biology Special Category:         None           Space Biology Special Category:         None           PI Camali:         Fax: FY           PI Corganization Type:         UNIVERSITY         Phone: 215-898-9949           Organization Name:         University of Pennsylvania         Fax: FY           PI Address 1:         Department of Psychiatry         Phone: 215-898-9949           PI Address 2:         Department of Psychiatry         Phone: 215-898-9949           PI Address 1:         Department of Psychiatry         Phone: 215-898-9949           PI Address 2:         Department of Psychiatry         Phone: 215-898-9949           PI Address 1:         Department of Psychiatry         Phone: 215-898-9949           Organization Name:         University of Pennsylvania         State: PA <th< td=""><td>75 N</td><td>W . D . I</td><td></td><td></td></th<>	75 N	W . D . I		
Program/Discipline—Element/Subdiscipline Element/Subdiscipline Element/Subdiscipline Element/Subdiscipline Element/Subdiscipline Joint Agency Name:  TechPort: Yes  Muman Research Program Elements: (1) BMPs Behavioral Haalth & Performance (archival in 2017)  Human Research Program Risks:  (1) BMed:Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders  Space Biology Element:  None  Space Biology Cross-Element Space Biology Special Category:  None  PI Email:  dinges/Gremmedicine upennedu Fax: FY  Pl Organization Type:  UNIVERSITY Phone: 215-898-9949  Organization Type:  UNIVERSITY of Pennsylvania  Pl Address 1:  Department of Psychiatry  Pl Address 2:  423 Service Dr., 1013 Blockley Hall  Pl Web Page:  City:  Pholadelphia State: PA  Jip Code:  19104-4209 Congressional District: 2  Comments:  Project Type:  GROUND Solicitation / Funding 2007 Crew Health Source: NNIOTZSA002N  Start Date:  0 5-01/2008 End Date:  0 5-01/2008 End Date:  No. of Post Dues:  0 0 No. of Phb Degree:  0 No. of Master' Degrees:  0 No. of Master' Degrees:  10 - One of Master' Degrees:  10 - One of Master' Degrees:  11 - One of Master' Degrees:  12 - One of Master' Degrees:  13 - One of Master' Degrees:  14 - One of Master' Degrees:  15 - One of Master' Degrees:  16 - One of Master' Degrees:  17 - One of Master' Degrees:  18 - One of Master' Degrees:  19 - One of Master' Degrees:  10 - One of Master' Degrees:  11 - One of Master' Degrees:  12 - One of Master' Degrees:  13 - One of Master' Degrees:  14 - One of Master' Degrees:  15 - One of Master' Degrees:  16 - One of Master' Degrees:  17 - One of Master' Degrees:  18 - One of Master' Degrees:  19 - One of Master' Degrees:  20 - One of Master' Degrees:  21 - One of Master' Degrees:  22 - One of Master' Deg				
		NSBRI		
Human Research Program Elements: (1) BMP-Behavioral Health & Performance (archival in 2017)  Human Research Program Risks: (1) BMed:Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders  Space Biology Cross-Element None  Space Biology Special Category: None  PI Email: dange-@penamedicine.apena.edu Fax: FY  PI Organization Type: University of Pennsylvania  PI Address 1: Department of Psychiatry  PI Address 2: 423 Service Dr., 1013 Blockley Hall  PI Web Page:  City: Philadelphia State: PA  Jip Code: 19104-4209 Congressional District: 2  Comments:  Project Type: GROUND Solication / Funding 2007 Crow Health Solication / Funding 2007 Crow Health Solication		NSBRINeurobehavioral and Psychosocial Factors Team		
Human Research Program Risks: (1) BMediRisk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders	Joint Agency Name:		TechPort:	Yes
Space Biology Element: None  Space Biology Cross-Element Discipline:  None  PI Email: dinges@nennmedicine.unenn.edu Fax: FY  PI Organization Type: UNIVERSITY Phone: 215-898-9949  Organization Name: University of Pennsylvania  PI Address 1: Department of Psychiatry  PI Address 2: 423 Service Dr., 1013 Blockley Hall  PI Web Page:  City: Philadelphia State: PA  Zip Code: 1910-4-4209 Congressional District: 2  Comments:  Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNIOTZSA00ZN  Start Date: 05-01/2008 End Date: 04/30/2012  No. of Post Does: 0 No. of Ph.D Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Email:  Flight Program:  Flight Assignment:  Key Personnet Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601	<b>Human Research Program Elements:</b>	(1) <b>BHP</b> :Behavioral Health & Performance (archival in 201	7)	
Space Biology Cross-Element Discipline:         None           Space Biology Special Category:         None           P1 Email:         dinges@penumedicine upenn.edu         Fax: FY           P1 Organization Type:         UNIVERSITY         Phone: 215-898-9949           Organization Name:         University of Pennsylvania           P1 Address 1:         Department of Psychiatry           P1 Address 2:         423 Service Dr., 1013 Blockley Hall           P1 Web Page:         State:           City:         Philadelphia         State:         PA           Zip Code:         19104-4209         Congressional District:         2           Comments:         Comments:         Project Type:         GROUND         Solicitation / Funding 2007 Crew Health Source: NNJ07ZSA00ZN           Start Date:         05501/2008         End Date: Old 40/30/2012         PA           Start Date:         05501/2008         End Date: Old 40/30/2012         PA           No. of PhD Degrees:         0         No. of PhD Degrees: Old No. of	Human Research Program Risks:	(1) <b>BMed</b> :Risk of Adverse Cognitive or Behavioral Conditi	ons and Psychiatric Disorders	s
Discipline: None Space Biology Special Category: None PI Email: dinges/Gpennmedicine upenn.edu Fax: FY PI Organization Type: UNIVERSITY Pl Organization Name: University of Pennsylvania PI Address 1: Department of Psychiatry PI Address 2: 423 Service Dr., 1013 Blockley Hall PI Web Page: City: Philadelphia State: PA Zip Code: 19104-4209 Congressional District: 2 Comments: Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNIO7ZSA002N Start Date: 05/01/2008 End Date: 04/30/2012 No. of Post Docs: 0 No. of PhD Degrees: 0 No. of PhD Candidates: 4 No. of Master' Degrees: 0 No. of Master's Candidates: 0 No. of Bachelor's 21 No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI Contact Monitor: Contact Phone: Contact Email: Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Gode, Namni (University) Gode, Namni (University of Pennsylvania) Grant/Contract No.: NCC 9-58-NBF01601	Space Biology Element:	None		
PI Email: dinges@pennmedicine.upenn.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 215-898-9949 Organization Name: University of Pennsylvania PI Address 1: Department of Psychiatry PI Address 2: 423 Service Dr., 1013 Blockley Hall PI Web Page: City: Philadelphia State: PA Zip Code: 19104-4209 Congressional District: 2 Comments: Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNU07ZSA002N Start Date: 05:01/2008 End Date: 04/30/2012 No. of Post Docs: 0 No. of PhD Degrees: 0 No. of PhD Candidates: 4 No. of Master' Degrees: 0 No. of Master's Candidates: 4 No. of Bachelor's Candidates: 21 No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI Contact Monitor: Contact Email: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goed, Namir (University of Pennsylvania) Grant/Contract No.: NCC 9-58-NBPF01601 Performance Goal No.:		None		
Pl Organization Type: UNIVERSITY Phone: 215-898-9949 Organization Name: University of Pennsylvania Pl Address 1: Department of Psychiatry Pl Address 2: 423 Service Dr., 1013 Blockley Hall Pl Web Page: City: Philadelphia State: PA Zip Code: 19104-4209 Congressional District: 2 Comments: Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNIO7ZSA002N Start Date: 05/01/2008 End Date: 04/30/2012 No. of Post Docs: 0 No. of PhD Degrees: 0 No. of PhD Candidates: 4 No. of Master' begrees: 0 No. of Master's Candidates: 4 No. of Master' begrees: 21 No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI Contact Monitor: Contact Honitor: Contact Email: Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania) Grant/Contract No.: NCC 9-58-NBPF01601 Performance Goal No.:	Space Biology Special Category:	None		
Organization Name: University of Pennsylvania  PI Address 1: Department of Psychiatry  PI Address 2: 423 Service Dr., 1013 Blockley Hall  PI Web Page:  City: Philadelphia State: PA  Zip Code: 19104-4209 Congressional District: 2  Comments:  Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNJ07ZSA002N  Start Date: 05/01/2008 End Date: 04/30/2012  No. of Post Does: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 4 No. of Master' Degrees: 0  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Honitor: Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	PI Email:	dinges@pennmedicine.upenn.edu	Fax:	FY
PI Address 1: Department of Psychiatry PI Address 2: 423 Service Dr., 1013 Blockley Hall PI Web Page:  City: Philadelphia State: PA  Zip Code: 19104-4209 Congressional District: 2  Comments:  Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NN107ZSA002N  Start Date: 05/01/2008 End Date: 04/30/2012  No. of Post Does: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Bachelor's 21  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Phone:  Contact Email: Flight Program: Flight Assignment: Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania) Grant/Contract No.: NCC 9-58-NBPF01601 Performance Goal No.:	PI Organization Type:	UNIVERSITY	Phone:	215-898-9949
Pl Address 2:	Organization Name:	University of Pennsylvania		
Pl Web Page:   City:	PI Address 1:	Department of Psychiatry		
City:         Philadelphia         State:         PA           Zip Code:         19104-4209         Congressional District:         2           Comments:           Project Type:         GROUND         Solicitation / Funding 2007 Crew Health Source: NNJ07ZSA002N           Start Date:         05/01/2008         End Date: 04/30/2012           No. of Post Does:         0         No. of PhD Degrees: 0           No. of PhD Candidates:         4         No. of Master' Degrees: 0           No. of Master's Candidates:         0         No. of Bachelor's Degrees: 21           No. of Bachelor's Candidates:         24         Monitoring Center: NSBRI           Contact Monitor:         Contact Phone:           Contact Email:           Flight Program:           Flight Assignment:           Key Personnel Changes/Previous PI:           COI Name (Institution):         Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)           Grant/Contract No.:         NCC 9-58-NBPF01601           Performance Goal No.:	PI Address 2:	423 Service Dr., 1013 Blockley Hall		
Zip Code: 19104-4209 Congressional District: 2  Comments:  Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNJ07ZSA002N  Start Date: 05/01/2008 End Date: 04/30/2012  No. of Post Docs: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Master' Degrees: 1  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	PI Web Page:			
Comments:  Project Type: GROUND Solicitation / Funding 2007 Crew Health Source: NNJ07ZSA002N Start Date: 05/01/2008 End Date: 04/30/2012 No. of Post Does: 0 No. of PhD Degrees: 0 No. of PhD Candidates: 4 No. of Master' Degrees: 0 No. of Master's Candidates: 0 No. of Master' Degrees: 21 No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI Contact Monitor: Contact Email: Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania) Grant/Contract No.: NCC 9-58-NBPF01601 Performance Goal No.:	City:	Philadelphia	State:	PA
Project Type: GROUND Solicitation / Funding 2007 Crew Health NU07ZSA002N  Start Date: 05/01/2008 End Date: 04/30/2012  No. of Post Docs: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Master' Degrees: 21  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Zip Code:	19104-4209	<b>Congressional District:</b>	2
Start Date: 05/01/2008 End Date: 04/30/2012  No. of Post Docs: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Bachelor's Degrees: 21  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Comments:			
No. of Post Docs:  No. of PhD Candidates:  4 No. of Master' Degrees:  No. of Master's Candidates:  No. of Master's Candidates:  No. of Bachelor's Candidates:  No. of Bachelor's Candidates:  No. of Bachelor's Candidates:  Contact Monitor:  Contact Email:  Flight Program:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	Project Type:	GROUND		
No. of PhD Candidates: 4 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Bachelor's Degrees: 21  No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Start Date:	05/01/2008	End Date:	04/30/2012
No. of Master's Candidates:  No. of Bachelor's Candidates:  124  Monitoring Center: NSBRI  Contact Monitor:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	No. of Post Docs:	0	No. of PhD Degrees:	0
No. of Bachelor's Candidates: 24 Monitoring Center: NSBRI  Contact Monitor: Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	No. of PhD Candidates:	4	No. of Master' Degrees:	0
Contact Monitor:  Contact Phone:  Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	No. of Master's Candidates:	0	No. of Bachelor's Degrees:	21
Contact Email:  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	No. of Bachelor's Candidates:	24	<b>Monitoring Center:</b>	NSBRI
Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	Contact Monitor:		<b>Contact Phone:</b>	
Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Contact Email:			
Key Personnel Changes/Previous PI:  COI Name (Institution): Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Flight Program:			
COI Name (Institution):  Metaxas, Dimitris (Rutgers University) Goel, Namni (University of Pennsylvania)  Grant/Contract No.:  NCC 9-58-NBPF01601  Performance Goal No.:	Flight Assignment:			
Goel, Namni (University of Pennsylvania)  Grant/Contract No.: NCC 9-58-NBPF01601  Performance Goal No.:	Key Personnel Changes/Previous PI:			
Performance Goal No.:	COI Name (Institution):			
	Grant/Contract No.:	NCC 9-58-NBPF01601		
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Research Impact/Earth Benefits:  The study focuses on the ability of an unobtrusive, automated optical technology to detect psychological stress, emotion and fatigue during operational performance. The knowledge gained has the potential to identify an objective, unobtrusive, automated method for the recognition, monitoring, and management of the risks of neutrobehavioral dysfunction in affect and alertiness in space (flight and in many Earth-based safety-sensitive occupations, such as transportation workers (e.g., truck drivers, train conductors, aritine pilots); operators in safety-sensitive industries (e.g., power plant control rooms); and military personal and interportation workers are control rooms; and military personal of the outcome of the outcome of the current project we have continued to expand the OCR algorithm to recognize facial expressions of emotion and behavioral indicators of excessive sleepiness (through slow eyelid closures). We are also continuing our work to improve the systems shally for correctly identify stress. Perficiency data cordinated procedures reliably induce stress, emotion and fatigue. During the second year, we have continued collecting data for the two experiments we propose do (noe nemotion recognition and one on stress and fatigue detection). Twenth healthy subjects have complicted the two experiments (n=11 in Experiment 1 and n=0 in Experiment 2). We are using these data to expand and improve the current OCR algorithm. Together with data acquired in year using these data to expand and improve the current OCR algorithm. Together with data acquired in year using these data to expand and improve the current OCR algorithm. Together with data acquired in year using these data on properties of footage and the properties of footage and acquired in the properties, and the properties of footage and and provided for facial emotional analysis and 20 hours of footage and so was collected for first part of the properties of footage and so was collected for firsts analysis. In addition,	Task Description:	Astronauts must maintain high-level performance while experiencing demanding workload and work schedules, extreme environmental risks, and psychosocial stressors in space (e.g., isolation, confinement). Stress, negative emotions and fatigue can jeopardize their cognitive performance and neurobehavioral status. The proposed research is developing and validating an objective, unobtrusive, computational model-based tracker of the human face that reliably identifies when astronauts are experiencing stress, emotion and fatigue at levels that compromise performance in space. This optical computer recognition (OCR) system will provide feedback to them for autonomous selection of countermeasures for stress, depression and fatigue. The project is being accomplished through collaborative efforts of Dr. David Dinges (Unit for Experimental Psychiatry) at the University of Pennsylvania School of Medicine, and Dr. Dimitris Metaxas (Computational Biomedicine Imaging and Modeling Center) at Rutgers University. The project has four specific aims: (1) Create an OCR system capable of monitoring facial displays of specific emotions (i.e. angry, happy and sad). (2) Improve our current OCR system's ability to detect facial expressions of high versus low performance-induced stress. (3) Develop OCR algorithms to identify fatigue due to sleep loss based on slow eyelid closures (PERCLOS). (4) Test the technical feasibility of data acquisition and reliability of the advanced OCR system in spaceflight analogs that contain neurobehavioral stressors relevant to spaceflight (e.g., NEEMO). The project has primary relevance to strategic goals of the NSBRI Neurobehavioral and Psychosocial Factors (NBPF) Team. Two major laboratory experiments for OCR development and validation are underway. The project is 50% complete. To date, half of the total number of subjects required to complete the two experiments have been studied.		
and fatigue during operational performance. The knowledge gained has the potential to identify an objective, unbottrastive, automated method for the recognition, monitoring, and management in rehists of neurobehavioral dysfunction in affect and alertness in space flight and in many Earth-based safety-sensitive couptaions, such as transportation workers (e.g., prover plant control rooms); and military personnel.  In the second year of the current project we have continued to expand the OCR algorithm to recognize facial expressions of emotion and behavioral indicators of excessive sleepiness (through slow cyclid closures). We are also continuing our work to improve the system's ability to correctly identify stress. Preliminary data confirm that the experimental procedures reliably induce stress, emotion and fatigue. During the second year, we have continued collecting data for the two experiments we proposed (one on emotion recognition and one on stress and detection.) Twenty healthy subjects have completed the two experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data to expand and improve the experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data or n=40 subjects have completed the two experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data or expand and improve the experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data or n=40 subjects and improve the experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data or n=40 subjects and improve the experiments [n=1 in Experiment 1 and n=9 in Experiment 2]. We are using lines data or n=40 subjects and improve the experiment 2 (arts sand fatigue detection). Twenty and improve the experiment 2 (arts sand fatigue detection). Twenty and subjects are n=40 subjects and subjects are necessary and artificial and artificial subjects.  In Experiment 2 (arts sand fatigue detection), 180 may of digitally recorded high definition footage was collec	Rationale for HRP Directed Research:			
of emotion and behavioral indicators of excessive sleepiness (through slow eyeldic discurse). We are also continuing our work to improve the system's ability to correctly identify stress. Preliminary data confirm that the experimental procedures reliably induce stress, emotion and fatigue. During the second year, we have continued collecting data for the two experiments we proposed (nor one motion recognition and one on stress and fatigue detection). Twenty healthy subjects have completed the two experiments (n=1 lin Experiment 1 and n=9 in Experiment 2). We are using these data to expand and improve the current OCR elagorithm. Together with data needing in year 1 on n=20 other subjects, a total of n=40 subjects have been studied to date (i.e., n=20 in each of the 2 experiments). In Experiment 1 (emotion recognition), 15 hours of footage for facial emotional analysis was collected. Subjective emotional questionnaires also were administered to all subjects.  Task Progress:  In Experiment 2 (stress and fatigue detection), 180 hours of digitally recorded high definition footage was collected capturing the faces of subjects during performance of the Psychomotro Vrigilance Task (PVT). Facelab data and PVT reaction times were simultaneously recorded throughout these test bouts, which were administered every 2 hours over the course of two consecutive days, 3 hours of footage was recorded for facial emotional analysis and 20 hours of footage also was collected for stress analysis. In addition, data from neuropsychological tasks, personality questionnaires, and subjective emotional rating scales were obtained from all subjects.  With regard to the stress-related hormone analysis in Experiment 2, a told 45 saliva samples were collected during stress-inducing tasks.  With regard to the stress-related hormone analysis in Experiment 2, a told 45 saliva samples were collected during these stress-inducing tasks.  Dinges DF, Metaxas DN, Minkel JD, Lee C, Caruso H, Banks S, McGlinchey EL. "Optical computer recognition of the fa	Research Impact/Earth Benefits:	and fatigue during operational performance. The knowledge gained has the potential to identify an objective, unobtrusive, automated method for the recognition, monitoring, and management of the risks of neurobehavioral dysfunction in affect and alertness in space flight and in many Earth-based safety-sensitive occupations, such as transportation workers (e.g., truck drivers, train conductors, airline pilots); operators in safety-sensitive industries (e.g.,		
Dinges DF, Metaxas D, Minkel JD, Lee C, Caruso H, Banks S, McGlinchey EL. "Optical computer recognition of the face to monitor stress, emotion and fatigue in space flight." 80th Annual Aerospace Medical Association Scientific Meeting, Los Angeles, CA, May 4, 2009.  Aviation, Space, and Environmental Medicine. 2009 Mar;80(3):224., Mar-2009  Abstracts for Journals and Proceedings  Dinges DF, Metaxas DN, Minkel JD, Banks S, Michael N. "Optical computer recognition of behavioral stress in space flight." NASA Human Research Program Investigators' Workshop, League City, TX, February 3, 2009.  NASA Human Research Program Investigators' Workshop, Abstract Book, February 2009., Feb-2009  Lim J, Wu WC, Wang J, Detre JA, Dinges DF, Rao H. "Imaging brain fatigue from sustained mental workload: an ASL perfusion study of the time-on-task effect." Neuroimage. 2010 Feb 15;49(4):3426-35. http://dx.doi.org/10.1016/j.neuroimage.2009.11.020; PMID: 19925871, Feb-2010  Awards  Dinges D. "Raymond F. Longacre Award for Outstanding Accomplishment in the Psychological and Psychiatric Aspects of Aerospace Medicine, Aerospace Medical Association, May 2009." May-2009  Rathjen T, Whitmore M, McGuire K, Goel N, Dinges DF, Tvaryanas AP, Zehner G, Hudson J, Dismukes RK, Musson DM. "An introduction to human factors in aerospace." in "Fundamentals of Aerospace Medicine (4th edition)." Ed. J.R. Davis et al. Philadelphia: Lippincott Williams & Wilkins, 2008. p. 491-515., Dec-2008  Dissertations and Theses  Minkel J. "Affective consequences of sleep deprivation." Dissertation, University of Pennsylvania, May 2009.	Task Progress:	of emotion and behavioral indicators of excessive sleepiness (through slow eyelid closures). We are also continuing our work to improve the system's ability to correctly identify stress. Preliminary data confirm that the experimental procedures reliably induce stress, emotion and fatigue. During the second year, we have continued collecting data for the two experiments we proposed (one on emotion recognition and one on stress and fatigue detection). Twenty healthy subjects have completed the two experiments (n=11 in Experiment 1 and n=9 in Experiment 2). We are using these data to expand and improve the current OCR algorithm. Together with data acquired in year 1 on n=20 other subjects, a total of n=40 subjects have been studied to date (i.e., n=20 in each of the 2 experiments).  In Experiment 1 (emotion recognition), 15 hours of footage for facial emotional analysis was collected. Subjective emotional questionnaires also were administered to all subjects.  In Experiment 2 (stress and fatigue detection), 180 hours of digitally recorded high definition footage was collected capturing the faces of subjects during performance of the Psychomotor Vigilance Task (PVT). Facelab data and PVT reaction times were simultaneously recorded throughout these test bouts, which were administered every 2 hours over the course of two consecutive days. 3 hours of footage was recorded for facial emotional analysis and 20 hours of footage also was collected for stress analysis. In addition, data from neuropsychological tasks, personality questionnaires, and subjective emotional rating scales were obtained from all subjects.  With regard to the stress-related hormone analysis in Experiment 2, a total of 45 saliva samples were collected during stress-inducing tasks (5 saliva samples per subject). EEG/EKG data were also collected during these stress-inducing		
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