REPORT DOCUMENTATION PAGE Dist: A

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE

3. REPORT TYPE AND DATES COVERED
Annual 30 Sep 94 TO 30 Oct 94

4. TITLE AND SUBTITLE
STTR94 A FOVEATED IMAGING SYSTEM TO REDUCE TRANSMISSION BANDWIDTH OF VIDEO IMAGES FROM REMOTE CAMERA SYSTEMS

5. FUNDING NUMBERS
F49620-94-C-0090
65502F
STTR/TS

6. AUTHOR(S)
Dr Bill Geisler

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
OFF-WORLD LABORATORIES
Suite 100
8920 Business Park Drive
Austin TX 78759

8. PERFORMING ORGANIZATION REPORT NUMBER
AFOSR-TR- 94 0755

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
AFOSR/NL
110 Duncan Ave Suite B115
Bolling AFB DC 20332-0001
Lt Col Collins

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

DTIC
ELECTE
DEC 07, 1994
S D
F

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release;
distribution unlimited.
A

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

Three design meetings were held at the University of Texas Vision Labs with Dr Bill Geisler's staff, this month to defien the communication protocol and the specifications for the initial screen. (1) A preliminary protocol design has been completed and approved by both UT design team and OWL design team. (2) A specification for the operational parameters of the initial system has been designed. (3) OWL completed a preliminary design of the screen driver.

19941201 059

14. SUBJECT TERMS

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
(U)	(U)	(U)	(U)

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std Z39-18
298-102

OWL

Off World Laboratories, Inc.

November 17, 1994

Accesion For		
NTIS CRA&I	☑	
DTIC TAB	☐	
Unannounced	☐	
Justification		
By		
Distribution /		
Availability Codes		
Dist	Avail and / or Special	
A-1		

Mr. Roger Goldenberg
ASOFR/PK
110 Duncan Suite B115
Bolling AFB DC 20332-0001

Dear Roger,

Thank you for you help in getting our contract payment squared away. As you may have guessed, this our companies first Government contract.

I have enclosed our first report and our invoice for $40,000.00. I will mail you the originals.

Thanks again.

Sincerely

Dan E Jennings
Executive Vice President

8920 Business Park Drive, Ste 100 • Austin, Texas 78759 • (512) 502-0299 • Fax (512) 502-8931

F49620 94-C-0090 Report ATPF94T004

A Foveated System Imaging System To Reduce Transmission Bandwidth OF Video Images From Remote Camera Systems.

Presented by
Homer L. Webb
Dr. Wilson Geisler

Off World Laboratories, Inc

OWL
Off World laboratories, Inc.
8920 Business Park Drive Suite 100
Austin, Texas 78759
512-502-0299 Fax 512-502-8931

OFF-WORLD LABORATORIES
Suite 100
8920 Business Park Drive
Austin, Texas 78759

TELEPHONE 512-502-0299
FACSIMILE 512-502-8931

November 15, 1994

U.S. DEPARTMENT OF DEFENSE
SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROGRAM

CC: Dr. Bill Geisler

FROM: Homer Webb

Re: Status Report Project number **ATF94T004**

Three design meetings were held at the University of Texas Vision Labs with Dr. Bill Geisler's staff, this month to define the communication protocol and the specifications for the initial screen.

A preliminary protocol design has been completed and approved by both UT design team and OWL design team.
The UT transmitter will transmit (3) words of (32) bits.
The first word will carry the x-axis position and width
The second word will carry the y-axis position and width
The third word will carry gray scale and control information.
The control information will be refined as the project develops.

A specification for the operational parameters of the initial system has been designed. The preliminary results are as follows:

The first system will be a 240 x 240 pixel display.
The maximum number of pixels per frame will be 3,000
The OWL driver will place pixels on the screen as directed by the UT interface.
The initial screen will be at least 5" x 5" viewing area.
A modified back lit LCD screen will be used for the initial test screen.
The OWL driver system will be prototype using "SM" off-the-shelf integrated circuits.

Owl completed a preliminary 422 hardware interface design between the UT transmitter and the OWL screen driver.
The interface design has been approved by the UT design team.

OWL completed a preliminary design of the screen driver.

The driver will accept three (32) bit words from the external 422 interface.
The driver will control the data transfer rate (maximum rate 30 frames a second).
The driver will not buffer the data.
The UT transmitter will be responsible for updating the display.
The driver will write one pixel at a time. Up to 3,000 pixels per frame.
The size of the pixel will be a 1X1 to 256 X256. Controlled by the UT interface.
The driver will have 8-bits gray scale resolution. (Display response may limit this to 4-bits)

A preliminary design review for the screen driver was held at UT on October 26, 1994.

The design was approved by the UT staff.
The operational features of the driver was presented and approved.

Project changes:

Saff changes:

William T. Capps has resigned from OWL. Homer Webb will fill this function until a replacement engineer is found.

University of Texas Center for Vision and Image Sciences
Progress Report 1

In addition to the establishment of preliminary protocol and screen designs with OWL, the University of Texas Center for Vision and Image Sciences (UT CVIS) has made the following progress:

1. An efficient algorithm to determine the size of the "Superpixels" (pixels whose size is determined by their eccentricity from the point of gaze of the eye) has been derived and coded in 'C' for execution on an ALACRON i860 processor.

- Superpixels will be arranged in a series of concentric rings, with each ring containing SuperPixels of a single width.

- The width of the Superpixels in a given ring ,i, will be determined by the following formula, which is based on human perception:

$$W_i = \frac{W_0}{\sqrt{2}}\left(1+\frac{\sqrt{x_i^2+y_i^2}}{\varepsilon^2}\right)$$

where w_i is the width of the Superpixel in ring i (in pixels), w_0 is the width of a Superpixel in the center of the screen (in pixels), x_i and y_i are the location of the south-west corner of the Superpixel, in degrees from the center of the screen, and ε is the point at which the resolution is half of its maximum value.

- Rings in which a non-integer number of Superpixels can fit on a single side of a ring will have the narrowest Superpixel in the center, with Superpixel height increasing to the corners, where Superpixels are w_i x w_i.

- In order to get maximum computational efficiency, only the Superpixel coordinates for one side of the ring are directly calculated.

Because the rings are symmetric, the coordinates from the single computed side are simply moved through three 90 degree rotations to establish the coordinates of all the Superpixels in the ring.

- The algorithm has been constructed such that the user may specify w_0, ε and the desired viewing angle. Additionally, although the preliminary screen size is 240 x 240, the algorithm will accept any square symmetric dimensions for easy transitions to larger screen sizes.

2. Calibration software for the eye tracker, specifically for this project, has been written and is currently being evaluated.

3. Still images, for the evaluation of the eye movement algorithms (currently under development) have been selected. These include a letter chart (to be used for the evaluation of visual clarity), a natural environment scene (for evaluation of cluttered high detail images) and a face (to evaluate the perception of human faces in telecommunication systems).