

CT Unit 2: Decoding Project Group: Name: Grace Wang and Abigail Eng

Introduction

The purpose of the decoding project is for students to become familiar with the binary number system, its arithmetic operations, and its relationships with other number systems. In addition, students will be able to see how easy binary numbers can be manipulated, compressed, or encrypted.

Tasks

In the past five years, *Laboratoire de recherche CT* detected some repeating structured signals from a remote planet *Fomalhaut b* that is 25 light years from *Earth* and is about three times the mass of *Jupiter*. These signals have been translated into a series of hexadecimal codes. After computer scientists, engineers, physicists, and mathematicians working around the clock for a few months, they are pleased to proclaim to the world that the procedure of creating (**encoding**) these codes has been identified!

Each group will be assigned a series of codes, and based on the identified encoding procedure each group will have to find (**decode**) the hidden message embedded in these codes. The codes and the encoding procedure are listed below.

1. Procedure:

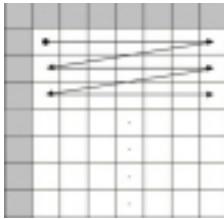
- 1) These detected messages were written in English that maybe related to some written words created by humans on Earth.
- 2) Each character (including space) has been coded into binary numbers using ASCII code.
- 3) The ASCII-coded binary numbers have been arranged in raster scan order (Figure 1) to form an 8 x 16 binary matrix (Figure 2).
- 4) Each ASCII-coded binary number in odd rows (1st, 3rd, 5th and 7th) has been added a number equivalent to its row number.
- 5) Each ASCII-coded binary number in even rows (0th, 2nd, 4th and 6th) has been subtracted a number equivalent to its row number.
- 6) The 8th column of the 8 x 16 matrix has been cut and inserted into the left side of the 0th column. 7) The newly formed binary number (cascading two numbers into one) in each row has been converted to a hexadecimal number.

2. Codes:

GP	1		2		3		4		5		6	
Code	20A0	30EE	24A0	34F3	2175	32ED	27AC	3BE9	2A68	3679	24F4	106F
	36EA	32A1	32F0	10E4	3AA1	3365	10F8	3AE9	337A	10E9	10EA	33A1
	32E6	3563	0F6C	36F3	3966	0F72	335F	33EC	0F75	33F2	389E	3966
	3BE8	33A3	3977	38F6	3423	3972	3BA3	11EB	366F	11F0	3223	3423
	301C	3864	0E5F	30E8	3465	0E6F	34DD	32E9	341C	309C	306B	2FE4
	3CF4	3525	3371	12EC	366D	3CF7	3F25	12ED	3AF7	336C	3D67	3373
	365D	38DB	331A	34E9	371A	34E8	33DB	31DE	34DC	2DE3	3363	2EDF
	37A7	4035	3DEF	35B5	3D6C	3735	3AA7	3633	3469	3AB5	3AEE	3D35
GP	7		8		9		10		11		12	
Code	21F2	31E5	2A68	3AE4	24A0	33E7	20EE	3764	26E1	3974	2A68	3AE4
	3167	10CA	3574	36FA	3A62	36EA	3875	3A21	37FA	3B66	3574	36FA
	391E	0F6B	0F75	0F67	3A9E	3665	3363	3AED	0F64	389E	0F75	0F67
	326A	3C76	3276	38A3	3971	11ED	3AA3	3C6F	3975	347B	3276	38A3
	2EE5	381C	0E6F	2E9C	309C	38EF	3873	301C	0E69	2FE1	0E6F	2E9C
	39F8	3375	336E	3AE6	3332	3CA5	3A25	34F4	3373	38F1	336E	3AE6
	371A	3566	2F1A	37ED	36EE	3469	36DF	0D63	399A	2FE8	2F1A	37ED
	3EF0	4035	39F6	3635	3CFC	3F35	3576	3DB5	3EF0	3DB3	39F6	3635

Deliverable

A word document describing all stages of the decoding process. Find the final, complete message and its author/source. (*Each group received two sets of code. They can be combined to form the who message.*)



$$\begin{bmatrix} A_{0,0} & A_{0,1} & \dots & A_{0,n-1} \\ A_{1,0} & A_{1,1} & \dots & A_{1,n-1} \\ \dots & \dots & \dots & \dots \\ A_{m-1,0} & A_{m-1,1} & \dots & A_{m-1,n-1} \end{bmatrix}$$

Mr. Lin

1

Fig. 1 Raster scan order Fig. 2 Row and column indices of a matrix

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An Example of Coding Process in the Decoding Project

1st Row
27AC
10F8
335F
3BA3
34DD
3F25
33DB
3AA7

Convert to Binary
0010 0111 1010 1100
0001 0000 1111 1000
0011 0011 0101 1111
0011 1011 1010 0011
0011 0100 1101 1101
0011 1111 0010 0101
0011 0011 1101 1011
0011 1010 1010 0111

Cut and Paste
0100 1111 0010 1100
0010 0001 0111 1000
0110 0110 0101 1111
0111 0111 0010 0011

0110 1001 0101 1101
0111 1110 0010 0101
0110 0111 0101 1011
0111 0101 0010 0111

Convert to Hexadecimal
4F, 2C (415, 212)
21, 78
66,5F
77, 23
69, 5D (513)
7E, 25 (714
67, 5B (511)
75, 27

Add even rows
4F, 2C
68, 61
6D, 61
6D, 61

subtract odd rows
20, 77
74, 20
79, 20
6E, 20

Convert back to binary
0100 1111 0010 1100
0010 0000 0111 0111
0110 1000 0101 0101
0111 0100 0010 0000
0110 1101 0110 0001
0111 1001 0010 0000
0110 1101 0110 0001
0110 1110 0010 0000

Convert to letters
O,
w
ha
t
ma
y
ma
n

2nd Row
3BE9
3AE9
33EC
11EB
32 E 9
12ED
31DE
3633

convert to binary
0011 1011 1110 1001
0011 1010 1110 1001
0011 0011 1110 1100

0001 0001 1110 1011
0011 0010 1110 1001
0001 0010 1110 1101
0011 0001 1101 1110
0011 0110 0011 0011

Cut & Paste
0111 0110 1110 1001
0111 0101 0110 1001
0110 0111 0110 1100
0010 0011 0110 1011
0110 0101 0110 1001
0010 0101 0110 1101
0110 0011 0101 1110
0110 1100 0011 0011

convert to hexademical
76, 69
75, 69
67, 6C
23, 6B
65, 69
25, 6D
63, 5E
6C, 33

Add even rows
77, 69
69, 6E
69, 6D
69, 64

subtract odd rows
74, 68
20, 68
20, 68
65, 2C

convert to letters
wi
th
in
h
im
h
id
e,

FULL SENTENCE
“O, what may man within him hide,” <i>from Measure for Measure by William Shakespeare</i>