INVENTION DISCLOSURE

1. **Invention Title. Coding and transport of 3D depth data for closed captions**

2. **Invention Summary.**
   The invention provides an efficient way to encode depth data (Z-axis) information to enable closed caption authoring for stereoscopic 3D content based on the CEA-608 caption standard.

3. **Invention Description**.

a. **Describe the invention in detail and/or attach a description, drawing(s) and/or diagram(s), if available. Please include flow charts for descriptions of software processes, and block diagrams for descriptions of hardware systems. Include the description/attachments in electronic form if possible.**
   The invention provides a way that can be used with closed caption signals to convey a unique depth value when closed captions are used with stereoscopic programming and rendered on a 3D display. The invention makes use of previously unused code-pairs within the CEA-608E standard to convey the depth information. This method to convey the depth information can work equally well with all the various types of closed captions provided by the CEA-608 standard including Roll-up captions, Pop-on captions, and Paint-on captions styles. This method is flexible enough to enable each independent caption window to have independent control of depth. The method permits each caption window to be displayed in a wide range from negative parallax (audience space) to positive parallax (behind the screen).

   The present CEA-608E caption standard defines nineteen unique "Miscellaneous Control Codes" using a unique two-byte pair for each data channel. (See table 52). These control codes provide miscellaneous display instructions or formatting commands to the caption decoder such as backspace, delete to end of row, Flash on, Carriage return, Tab offset, etc. The invention describes a method to expand the use of the two-byte control codes to instruct a 3D capable caption decoder to adjust the parallax by a range of pixel values that for the purpose of illustration go from -40 to +40 pixels. This parallax value is used by the 3D caption decoder (for example the one described by Invention Disclosure #60230) to determine the Left and Right image offset values.

   The advantage of this system and method over the previous disclosure, is that it enables the author of the captions to determine the exact depth placement for each caption window with certainty, rather than an approach where the decoder alone determines the appropriate placement. This invention allows for some captions to be placed in front of the screen plane (Zero Parallax Position or ZPS) while separate caption elements are placed behind the screen plane or ZPS.

   The method described requires very little data overhead and only requires 2 bytes of additional information for each caption element. A preferred method of implementation is

to use the extension of the Miscellaneous Control Code table as shown below to describe the new Z-Axis (parallax) data:

Miscellaneous Control Codes

Data Channel 1		Data Channel 2		Mnemonic	Description
14	20	1C	20	RCL	Resume caption loading
14	21	1C	21	BS	Backspace
14	22	1C	22	AOF	Reserved (formerly Alarm off)
14	23	1C	23	Aon	Reserved (formerly Alarm on)
14	24	1C	24	DER	Delete to End of Row
14	25	1C	25	RU2	Roll-up Captions-2 Rows
14	26	1C	26	RU3	Roll-up Captions-3 Rows
14	27	1C	27	RU4	Roll-up Captions-4 Rows
14	28	1C	28	FON	Flash On
14	29	1C	29	RDC	Resume Direct Captioning
14	2A	1C	2A	TR	Text Restart
14	2B	1C	2B	RTD	Resume Text Display
14	2C	1C	2C	EDM	Erase Displayed Memory
14	2D	1C	2D	CR	Carriage Return
14	2E	1C	2E	ENM	Erase Non-displayed memory
14	2F	1C	2F	EOC	End of Caption (flip memories)
17	21	1F	21	TO1	Tab Offset 1 Column
17	22	1F	22	TO2	Tab Offset 2 Columns
17	23	1F	23	TO3	Tab Offset 3 Columns
14	57	1C	57	-40	Pixels (negative) parallax
14	56	1C	56	-39	Pixels (negative) parallax
14	55	1C	55	-38	Pixels (negative) parallax
14	54	1C	54	-37	Pixels (negative) parallax
14	53	1C	53	-36	Pixels (negative) parallax
14	52	1C	52	-35	Pixels (negative) parallax
14	51	1C	51	-34	Pixels (negative) parallax
14	50	1C	50	-33	Pixels (negative) parallax
14	4F	1C	4F	-32	Pixels (negative) parallax
14	4E	1C	4E	-31	Pixels (negative) parallax
14	4D	1C	4D	-30	Pixels (negative) parallax
14	4C	1C	4C	-29	Pixels (negative) parallax
14	4B	1C	4B	-28	Pixels (negative) parallax
14	4A	1C	4A	-27	Pixels (negative) parallax
14	49	1C	49	-26	Pixels (negative) parallax
14	48	1C	48	-25	Pixels (negative) parallax
14	47	1C	47	-24	Pixels (negative) parallax
14	46	1C	46	-23	Pixels (negative) parallax
14	45	1C	45	-22	Pixels (negative) parallax
14	44	1C	44	-21	Pixels (negative) parallax
14	43	1C	43	-20	Pixels (negative) parallax
14	42	1C	42	-19	Pixels (negative) parallax
14	41	1C	41	-18	Pixels (negative) parallax
14	40	1C	40	-17	Pixels (negative) parallax
14	3F	1C	3F	-16	Pixels (negative) parallax

14	3E	1C	3E	-15	Pixels (negative) parallax
14	3D	1C	3D	-14	Pixels (negative) parallax
14	3C	1C	3C	-13	Pixels (negative) parallax
14	3B	1C	3B	-12	Pixels (negative) parallax
14	3A	1C	3A	-11	Pixels (negative) parallax
14	39	1C	39	-10	Pixels (negative) parallax
14	38	1C	38	-9	Pixels (negative) parallax
14	37	1C	37	-8	Pixels (negative) parallax
14	36	1C	36	-7	Pixels (negative) parallax
14	35	1C	35	-6	Pixels (negative) parallax
14	34	1C	34	-5	Pixels (negative) parallax
14	33	1C	33	-4	Pixels (negative) parallax
14	32	1C	32	-3	Pixels (negative) parallax
14	31	1C	31	-2	Pixels (negative) parallax
14	30	1C	30	-1	Pixel (negative) parallax
17	30	1F	30	1	Pixel (positive) parallax
17	31	1F	31	2	Pixels (positive) parallax
17	32	1F	32	3	Pixels (positive) parallax
17	33	1F	33	4	Pixels (positive) parallax
17	34	1F	34	5	Pixels (positive) parallax
17	35	1F	35	6	Pixels (positive) parallax
17	36	1F	36	7	Pixels (positive) parallax
17	37	1F	37	8	Pixels (positive) parallax
17	38	1F	38	9	Pixels (positive) parallax
17	39	1F	39	10	Pixels (positive) parallax
17	3A	1F	3A	11	Pixels (positive) parallax
17	3B	1F	3B	12	Pixels (positive) parallax
17	3C	1F	3C	13	Pixels (positive) parallax
17	3D	1F	3D	14	Pixels (positive) parallax
17	3E	1F	3E	15	Pixels (positive) parallax
17	3F	1F	3F	16	Pixels (positive) parallax
17	40	1F	40	17	Pixels (positive) parallax
17	41	1F	41	18	Pixels (positive) parallax
17	42	1F	42	19	Pixels (positive) parallax
17	43	1F	43	20	Pixels (positive) parallax
17	44	1F	44	21	Pixels (positive) parallax
17	45	1F	45	22	Pixels (positive) parallax
17	46	1F	46	23	Pixels (positive) parallax
17	47	1F	47	24	Pixels (positive) parallax
17	48	1F	48	25	Pixels (positive) parallax
17	49	1F	49	26	Pixels (positive) parallax
17	4A	1F	4A	27	Pixels (positive) parallax
17	4B	1F	4B	28	Pixels (positive) parallax
17	4C	1F	4C	29	Pixels (positive) parallax
17	4D	1F	4D	30	Pixels (positive) parallax
17	4E	1F	4E	31	Pixels (positive) parallax
17	4F	1F	4F	32	Pixels (positive) parallax
17	50	1F	50	33	Pixels (positive) parallax
17	51	1F	51	34	Pixels (positive) parallax
17	52	1F	52	35	Pixels (positive) parallax

17	53	1F	53	36	Pixels (positive) parallax
17	54	1F	54	37	Pixels (positive) parallax
17	55	1F	55	38	Pixels (positive) parallax
17	56	1F	56	39	Pixels (positive) parallax
17	57	1F	57	40	Pixels (positive) parallax

b. **Why was the invention developed? What problem(s) does the invention solve? How is it better?**
The method provides an efficient method to encode a depth parameter for caption signals that is compatible with the present system and authoring equipment.

c. **Briefly outline the potential commercial value and customers of the invention.**
FCC rules will require and expect that 3D programming is captioned. While the previous invention provides a suitable mechanism to accomplish this while avoiding depth conflicts, the present invention provides greater control and freedom over the placement of these captions in the depth space.

4. **HOW is your invention different from existing products, processes, systems?**
Please list the closest publication(s), product(s), method(s), patent(s), etc. to your invention.   For each item, how is your invention different?
The previous disclosure did not provide a specific means to convey the caption author's intent or creative choice for the depth placement. This invention adds that missing functionality.