A APPENDIX

A.1 PROMPTS UTILIZED IN THIS STUDY

In this work, we use two prompt templates to evaluate the effectiveness of concept identification by the GPT-4V model across two different modalities: vision- and text-based representations.

For the visual modality, the drawings are presented as images generated from the sequence of coordinates. The prompt template for this modality involves showing the model the bitmap image of the drawing and asking it to identify the concept depicted in the image.

For the textual modality, the pen stroke vectors are encoded using the TikZlanguage. This format allows the representation of drawings as a series of coordinates and commands that describe the strokes. The prompt template for this modality involves presenting the model with these TikZ-encoded coordinates and asking it to identify the concept represented by the strokes.

Both prompts are designed to elicit open-ended responses from the model, allowing it to consider a wide range of possible concepts, including those not in the predefined 20-concept set. This approach ensures that the model's identification process is not constrained by a limited set of options, thereby providing a more comprehensive evaluation of its capabilities in both modalities.

Prompt 1: Prompt template for the vision-based modality.

```
 Your task is to identify a concept drawn by hand.  You will be
provided with an image corresponding to a concept drawn by hand.
Your task is to identify, based on the provided picture, the
concept that someone has attempted to draw.  Please reply only with
the name of the concept.
```

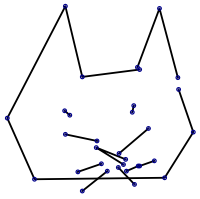
Image URL: base 64 encoded drawing (256×256)

Prompt 2: Prompt template for the text-based modality.

```
 Your task is to identify a concept drawn by hand.  You will be
provided a TikZpicture format corresponding to a concept, where
each stroke is indicated by the command 'draw' followed by a series
of points in '(x,y)' format.
The points are connected by straight lines, denoted by '--'.  The
strokes collectively represent a concept.  Below is the TikZpicture
code enclosed within triple backticks:
'''{TikZ code}'''.
Your task is to identify, based on the provided TikZpicture, the
concept that someone has attempted to draw.  Please reply only with
the name of the concept.
```

Example of image for the concept `cat` The vision-based modality, on the other hand, involves using images created from the sequence of coordinates from the *Quick, Draw!*dataset. These images are produced by plotting the coordinates with a function that defines the image size as 256×256 pixels. The image is then stored in PNG format.

The following is an example of an image representing the `cat`, extracted from the *Quick, Draw!* dataset.



Example of TikZ code for the concept `cat` TikZ is a LaTeX package used for creating graphics programmatically. Because of its way of representing drawings through coordinate-based commands, we used TikZ in the text-modality tests.

Each drawing in the *Quick, Draw!* dataset is stored as vectors of distinct pen strokes, represented by sequences of (x, y) coordinates. For each stroke in the drawing, the sequence of points is translated into a `\draw` command. The points are connected using the `--` operator, which denotes a straight line between two points. Each drawing consists of multiple strokes, and each segment is represented by a separate `\draw` command in TikZ.

The following is an example of the TikZ code of the concept `cat`, extracted from the *Quick, Draw!* dataset.

```
\draw (181, 30) -- (121, 12) -- (14, 95) -- (0, 161) -- (42, 255) --
    (73, 213) -- (136, 226) -- (236, 194) -- (242, 230) -- (255, 156) --
    (218, 38) -- (161, 2) -- (141, 15);
\draw (118, 92) -- (76, 118);
\draw (119, 81) -- (87, 76);
\draw (112, 70) -- (102, 57);
\draw (146, 98) -- (192, 107);
\draw (151, 76) -- (203, 86);
\draw (154, 53) -- (175, 51);
\draw (135, 138) -- (137, 71) -- (123, 81);
```

A.2 Accepted Hyponyms for each Concept

Table 3: Accepted hyponyms for each concept. In this study, we establish a set of accepted hyponyms for each concept. A hyponym is a more specific term within a broader category, and for our purposes, identifying a hyponym is considered correct if it falls under the general expected concept. For instance, if the expected concept is `car`, identifying `ambulance` is still correct because it is a specific type of car. This table lists each concept and its accepted hyponyms. These hyponyms are identified in the pre-framework experiment and validated by human inspection.

Concept (c)	Hyponyms ($h(c)$)
Apple	Apple with a stem Apple with a leaf
Banana	Banana peel
Car	Ambulance Hovercar Monster truck Hovercraft Floating car Flying car
Cat	Cat whiskers Cat face Cat playing with a toy Origami cat

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Concept (c)	Hyponyms ($h(c)$)
	Cat head
	Cat and chair
	Schrodinger's cat
	Cat ear headband
	A cat under a table
	Geometric fox head
	Whiskers
	Spider-cat
	Sun with cat ears
	Sleeping cat
	Low poly cat
	Cat chasing a laser pointer
	Cat playing with a ball of yarn
	Cat chasing a mouse
Computer	Laptop
	Desktop computer
Cup	Coffee cup
	Coffee mug
	Martini glass
	Measuring cup
	Mug
	Takeout coffee cup
	Tea cup with tea bag
	Teacup
	Origami cup
	Cup with handle
	Paper cup
Door	Car door
	Door
	Open door
	Door with a pet door
Envelope	Email envelope
Fish	Origami fish
House	House and tree
Key	Allen key
	Key and crystal
	Key and lock
	Key and screwdriver
	Wrench
	Key and saw
	House key
	Key and obelisk
	Key and tower
	Key and keyhole
	Arrow key
	Hex key
Radio	Car radio
Sun	Sunburst
	Sunlight
	Sunshine
	Sunrise
Sword	Crossed swords
	Excalibur
	Katana

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Concept (c)	Hyponyms ($h(c)$)
	Sword in the stone
	Fencing sword
	Dagger
Television	TV
	TV antenna
	Television with antenna
	Video streaming
	Video play
	Television playing a video
Tree	Christmas tree
	Baobab tree
	Palm tree
	Bonsai tree
	Pine tree
	Tree with a broken branch
	Tree branches

A.3 CONFUSION TABLES OF THE CLASSIFICATION

Table 4: Confusion matrix showing the number of times each concept is accurately predicted or misclassified in the visual-based modality (images). Each cell in the matrix represents the count of instances for a specific actual concept versus a predicted concept. The "Other" column shows the number of predictions that do not match any predefined concepts, since GPT-4 is allowed to provide open-ended answers.

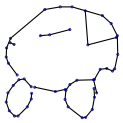
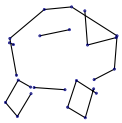
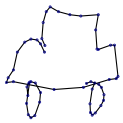
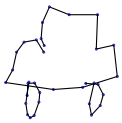
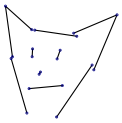
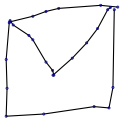
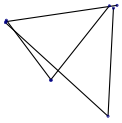
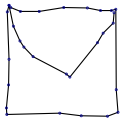
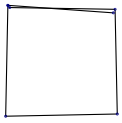
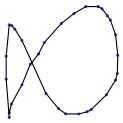
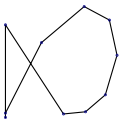
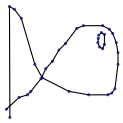
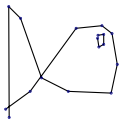
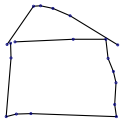
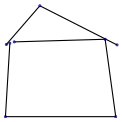
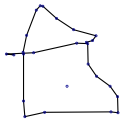
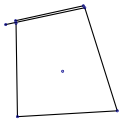
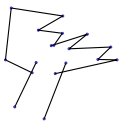
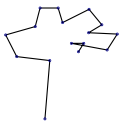
Predicted concept **Concept**	banana	fish	string bean	sun	The Great Wall of China	envelope	sword	tree	television	car	hockey puck	grass	cat	house	apple	computer	radio	key	cup	door	**Other**	**Total**
banana	**78** (**15.63**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.20%)	0 (0.00%)	420 (84.17%)	499
fish	0 (0.00%)	**149** (**25.25**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.34%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.51%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.34%)	0 (0.00%)	0 (0.00%)	434 (73.56%)	590
string bean	15 (3.55%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	1 (0.24%)	2 (0.47%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	404 (95.73%)	422
sun	0 (0.00%)	0 (0.00%)	0 (0.00%)	**174** (**40.37**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	257 (59.63%)	431
The Great Wall of China	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	1 (0.18%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.18%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	6 (1.07%)	553 (98.57%)	561
envelope	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**277** (**60.48**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	181 (39.52%)	458
sword	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.21%)	0 (0.00%)	0 (0.00%)	**95** (**19.87**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.21%)	0 (0.00%)	1 (0.21%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	380 (79.50%)	478
tree	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.16%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**187** (**30.02**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.48%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	16 (2.57%)	1 (0.16%)	415 (66.61%)	623
television	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	5 (0.90%)	1 (0.18%)	0 (0.00%)	**243** (**43.86**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.18%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.18%)	0 (0.00%)	4 (0.72%)	4 (0.72%)	295 (53.25%)	554
car	0 (0.00%)	15 (1.91%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.38%)	0 (0.00%)	**112** (**14.29**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	14 (1.79%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.13%)	639 (81.51%)	784
hockey puck	0 (0.00%)	1 (0.19%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	53 (9.83%)	1 (0.19%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	9 (1.67%)	0 (0.00%)	1 (0.19%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	474 (87.94%)	539
grass	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.32%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	313 (99.68%)	314
cat	0 (0.00%)	0 (0.00%)	0 (0.00%)	10 (1.41%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**400** (**56.42**%)	1 (0.14%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.42%)	1 (0.14%)	294 (41.47%)	709
house	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	36 (8.20%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**248** (**56.49**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	155 (35.31%)	439
apple	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.16%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.31%)	**235** (**36.89**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.31%)	0 (0.00%)	397 (62.32%)	637
computer	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	8 (1.40%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.52%)	0 (0.00%)	**101** (**17.63**%)	0 (0.00%)	0 (0.00%)	4 (0.70%)	7 (1.22%)	450 (78.53%)	573
radio	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	24 (3.74%)	0 (0.00%)	0 (0.00%)	26 (4.06%)	40 (6.24%)	0 (0.00%)	0 (0.00%)	1 (0.16%)	20 (3.12%)	0 (0.00%)	2 (0.31%)	**41** (**6.40**%)	0 (0.00%)	3 (0.47%)	0 (0.00%)	484 (75.51%)	641
key	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (0.41%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**151** (**20.80**%)	1 (0.14%)	4 (0.55%)	567 (78.10%)	726
cup	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	19 (3.25%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.17%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**77** (**13.16**%)	4 (0.68%)	484 (82.74%)	585
door	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	8 (2.08%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.52%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.26%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.52%)	**31** (**8.05**%)	341 (88.57%)	385
Total	**93**	**165**	**0**	**187**	**0**	**437**	**99**	**190**	**270**	**154**	**0**	**0**	**402**	**307**	**235**	**105**	**42**	**153**	**113**	**59**	**7937**	**10,948**

Table 5: Confusion matrix showing the number of times each concept is accurately predicted or misclassified in the text-based modality (coordinates). Each cell in the matrix represents the count of instances for a specific actual concept versus a predicted concept. The "Other" column shows the number of predictions that do not match any predefined concepts, since GPT-4 is allowed to provide open-ended answers.

Predicted concept **Concept**	banana	fish	string bean	sun	The Great Wall of China	envelope	sword	tree	television	car	hockey puck	grass	cat	house	apple	computer	radio	key	cup	door	Other	**Total**
banana	**0** (**0.00**%)	6 (1.20%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	8 (1.60%)	0 (0.00%)	2 (0.40%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	106 (21.24%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	377 (75.55%)	499
fish	0 (0.00%)	**15** (**2.54**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.17%)	0 (0.00%)	14 (2.37%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	122 (20.68%)	1 (0.17%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	437 (74.07%)	590
string bean	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	2 (0.47%)	0 (0.00%)	1 (0.24%)	0 (0.00%)	2 (0.47%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	115 (27.25%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	302 (71.56%)	422
sun	0 (0.00%)	8 (1.86%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	28 (6.50%)	0 (0.00%)	1 (0.23%)	0 (0.00%)	0 (0.00%)	2 (0.46%)	138 (32.02%)	1 (0.23%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	253 (58.70%)	431
The Great Wall of China	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	7 (1.25%)	0 (0.00%)	18 (3.21%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	85 (15.15%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	451 (80.39%)	561
envelope	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**25** (**5.46**%)	0 (0.00%)	2 (0.44%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	230 (50.22%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	201 (43.89%)	458
sword	0 (0.00%)	3 (0.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.42%)	**0** (**0.00**%)	48 (10.04%)	0 (0.00%)	3 (0.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	152 (31.80%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.21%)	0 (0.00%)	0 (0.00%)	269 (56.28%)	478
tree	0 (0.00%)	4 (0.64%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.16%)	0 (0.00%)	**162** (**26.00**%)	0 (0.00%)	6 (0.96%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	173 (27.77%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	277 (44.46%)	623
television	0 (0.00%)	3 (0.54%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	22 (3.97%)	0 (0.00%)	2 (0.36%)	**0** (**0.00**%)	56 (10.11%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	386 (69.68%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	85 (15.34%)	554
car	0 (0.00%)	4 (0.51%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.13%)	0 (0.00%)	64 (8.16%)	0 (0.00%)	**31** (**3.95**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	324 (41.33%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	360 (45.92%)	784
hockey puck	0 (0.00%)	11 (2.04%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	15 (2.78%)	0 (0.00%)	4 (0.74%)	0 (0.00%)	5 (0.93%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	269 (49.91%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	235 (43.60%)	539
grass	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	30 (9.55%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	3 (0.96%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	281 (89.49%)	314
cat	0 (0.00%)	39 (5.50%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	68 (9.59%)	0 (0.00%)	48 (6.77%)	0 (0.00%)	0 (0.00%)	**16** (**2.26**%)	275 (38.79%)	1 (0.14%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	262 (36.95%)	709
house	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	7 (1.59%)	0 (0.00%)	3 (0.68%)	0 (0.00%)	4 (0.91%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**280** (**63.78**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	145 (33.03%)	439
apple	0 (0.00%)	11 (1.73%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	30 (4.71%)	0 (0.00%)	5 (0.78%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	308 (48.35%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	2 (0.31%)	0 (0.00%)	0 (0.00%)	281 (44.11%)	637
computer	0 (0.00%)	1 (0.17%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	21 (3.66%)	0 (0.00%)	2 (0.35%)	0 (0.00%)	49 (8.55%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	425 (74.17%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	75 (13.09%)	573
radio	0 (0.00%)	9 (1.40%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	4 (0.62%)	0 (0.00%)	4 (0.62%)	0 (0.00%)	107 (16.69%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	440 (68.64%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	77 (12.01%)	641
key	0 (0.00%)	1 (0.14%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.14%)	0 (0.00%)	58 (7.99%)	0 (0.00%)	9 (1.24%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	309 (42.56%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	0 (0.00%)	348 (47.93%)	726
cup	0 (0.00%)	42 (7.18%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	7 (1.20%)	0 (0.00%)	10 (1.71%)	0 (0.00%)	17 (2.91%)	0 (0.00%)	0 (0.00%)	1 (0.17%)	313 (53.50%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	0 (0.00%)	195 (33.33%)	585
door	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	14 (3.64%)	0 (0.00%)	7 (1.82%)	0 (0.00%)	2 (0.52%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	219 (56.88%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0** (**0.00**%)	143 (37.14%)	385
Total	**0**	**157**	**0**	**0**	**0**	**130**	**0**	**563**	**0**	**347**	**0**	**0**	**19**	**4672**	**3**	**0**	**0**	**3**	**0**	**0**	**5054**	**10,948**

A.4 Original and Simplest Drawing for each Modality

Table 6: Original and simplest drawing for each concept and modality. For each concept, the table includes both the original drawing and its simplified version, as processed by the Ramer–Douglas–Peucker algorithm. The original drawings are those directly sourced from the *Quick, Draw!* dataset. In contrast, the simplest drawings result from iterative simplification, which reduces the number of segments while preserving the essential characteristics of the concept. This simplified version represents the minimal form that GPT-4, the multimodal large language model used in this study, can still recognize with a high probability (as per the definition of teaching size of this work). By comparing these drawings, we can better understand the inherent simplicity or complexity of each concept and how it translates across visual and textual representations.

Concept	Original (images)	Simplified (images)	Original (coordinates)	Simplified (coordinates)
Car				
Cat				
Envelope				
Fish				
House				
Tree				

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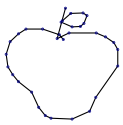
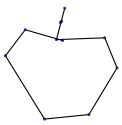
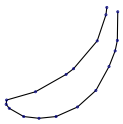
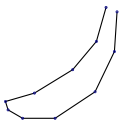
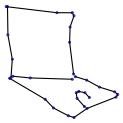
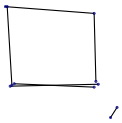
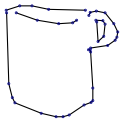
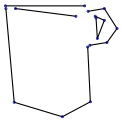
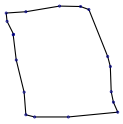
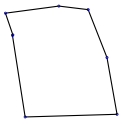
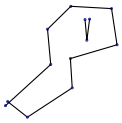
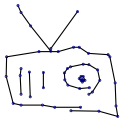
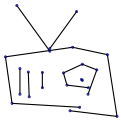
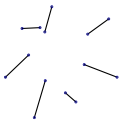
Concept	Original (images)	Simplified (images)	Original (coordinates)	Simplified (coordinates)
Apple				
Banana				
Computer				
Cup				
Door				
Key				
Radio				
Sun				

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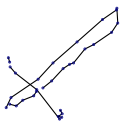
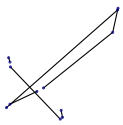
Concept	Original (images)	Simplified (images)	Original (coordinates)	Simplified (coordinates)
Sword				
Television