

A Target Pool and Database for Anomalous Cognition Experiments¹

by

Edwin May and Laura Faith
The Laboratories for Fundamental Research
Palo Alto, California

and

Maggie Blackman, Bob Bourgeois, Nicola Kerr, and Lisa Woods
The Rhine Research Center
Durham, North Carolina

Abstract

Based upon our earlier work with anomalous cognition target pools and fuzzy set analysis, we have constructed a new target pool of 300 images. These have been derived from the Corel Stock Photo Library of Professional Photographs. This library of copyright-free images is in digital form and comprises 100 images on each of 200 CD-ROM's. All 300 images meet a set of predefined cognitive, thematic, and size constraints. The images were scored against 50 potential fuzzy set elements by six independent coders. We selected 24 of the 50 elements and constructed a qualitative consensus score from the six coders as the fuzzy set representations of the target photographs. As a check on the veracity of the coding, we examined the set using cluster analysis. We found that the images grouped cleanly into categories that contained images that were equivalent, and these categories grouped into units that were different from one another. Additionally, the average entropy, its average gradient, and total entropy was computed for each image. All of this information was entered into an Access 97 database.

¹ This work was supported by a grant from the Fundação Bial, Porto Portugal.

Introduction

In 1990 a group working at SRI International published an approach to target pool construction and the analysis of anomalous cognition experiments (May, Utts, Humphrey, Luke, Frivold, and Trask, 1990).² They adapted standard fuzzy set technology to provide a quantitative description of both the targets and responses in AC experiments. This approach is similar to the more widely used idea of descriptor sets. That is, a series of concepts, such as *predominantly shady*, are scored either yes or no depending upon the particular target. The problem is, of course, that an analyst is required to score a fundamentally subjective idea into a binary response. The target is or is not *predominantly shady*. A fuzzy set modification allows an analyst to score the degree to which she/he thinks the target is *predominantly shady* on a zero-to-one scale.

We have improved the fuzzy set approach by significantly limiting the number of elements from 131 proposed by May et al. to 24. Based upon this reduction, we have constructed a new target pool from a copyright-free set of CD-ROM images.

Target Pool Construction

The target pool is based exclusively upon the Corel Stock Photo Library of Professional Photographs. This library of copyright-free images is in digital form and comprises 100 images on each of 200 CD-ROM's. Each image is approximately 18 MB in size, which corresponds to a landscape format picture of 3200 × 1875 pixels in 24-bit color. Corel also publishes a booklet of thumbnail images of the complete set.

Selection Criteria

The first stage in constructing the target pool consisted of creating a design specification of the type of photographs that would qualify as a potential anomalous cognition (AC) target. Based upon earlier experience (May, et al., 1990), we adopted the following guidelines:

The photographs must conform to the following general properties.

- Thematic Coherence. Each photograph must be a real scene as opposed to a collage, and where possible should possess elements that could be easily sketched.
- Size Homogeneity. The photographs must not contain any surprises with regard to size. For example, there could not be a photograph of a brick and another of a mountain range.
- Pool Coherence. All the photographs must consist of only outside scenes.

² Anomalous cognition (AC) will be used throughout this paper instead of the more widely used term ESP or remote viewing.

The following elements were not included in the pool by construction or by digital photographic editing:

- People
- Transportation Devices (e.g., boats, cars, etc.).
- Small Human Artifacts (e.g., furniture, tools, toys, etc.).

We made every effort to remove these kinds of items; however, they may be present in some photographs. If so, they are very difficult to see and in all cases are insignificant relative to the rest of the scene.

Finally, we did not allow:

- Odd camera angles or unusual or distorted perspectives.
- Odd or unusual lighting conditions.

Aside from the above restrictions, the target pool photographs can be any scenes, anywhere.

Following these guidelines, we rejected approximately half of the original set of 20,000 photographs by visual inspection of the thumbnail images.

For the development of this target pool, we adopted a hierarchical design of Groups, Categories, and Images. A Group consists of five Categories and each Category contains five images. The images within a Category are as much like each other as possible, though they are of different scenes. Differing perspectives of the same scene are not included. Thus, a single Category of *waterfalls*, for example, does contain five similar, but different, waterfalls. In contrast we made every attempt to choose Categories within a Group to be as different from one another as possible—to make them orthogonal, in other words. We would not have a *river* Category in the same Group as a *waterfall* Category, for example. The number of different Groups was determined by the remaining 10,000 images that survived the first cut.

Two LFR personnel examined all of the remaining 10,000 images on a high-resolution computer display where approximately 800 candidate photographs met the above acceptance criteria. After limited digital editing, we identified from this set of 800 photographs, 12 Groups of 25 images for a total of 300 targets. Table 1 shows the Categories that were identified for each of the 12 target Groups. No attempt was made to force the Categories to be orthogonal across Groups.

Table 1. Categories for Each Target Group

Group ID	Category				
	1	2	3	4	5
1	Bridges	Canyons	Cities	Structures	Waterfalls
2	Bridges	Cities	Fields	Mountains	Structures
3	Bridges	Lakes	Mountains	Structures	Towns
4	Bridges	Mosques	Mountains	Roads	Waterfalls
5	Bridges	Churches	Deserts	Mountains	Pyramids
6	Fields	Islands	Roads	Ruins	Waterfalls
7	Cities	Coasts	Deserts	Waterfalls	Windmills
8	Coasts	Fields	Lighthouses	Mountains	Rivers
9	Buildings	Coasts	Pyramids	Vineyards	Waterfalls
10	Buildings	Coasts	Fences	Lakes	Rocks
11	Fields	Structures	Rivers	Ruins	Streets
12	Coasts	Mountains	Roads	Ruins	Towns

* All Structures in the table represent Oriental Structures

Figure 1 shows an example of the digital editing of an image that was not selected as part of the pool to illustrate the capability to modify an image to conform to the construction guidelines. In the temple scene, nearly all the people were removed by making reasonable guesses as to what the image would have been behind each individual. As the final step in preparing an image for the target pool, the picture was cropped if necessary, and resized to 800 by 600 pixels, each having 24 bits of color information.



Figure 1. An Example of Digital Editing

Fuzzy Set Encoding

To facilitate subsequent computer analysis of AC trials, the images were encoded using a system of descriptive elements. Each element was assigned a fuzzy set membership value for each image. We created a universal set of elements (USE), comprising 50 elements, which we selected from the original set of 131 used in our earlier work (May, et al., 1990). We also added elements for features that were unique to this particular set of photographs. Six individuals each coded all 300 images against this USE. As in earlier work, the coding criterion was the degree to which each element was visually impacting to the general scene. The range of visual impact ran from zero to one in steps of 0.1. For example, in the bottom image in Figure 1 we might code 0.6 for *buildings* and 0.3 for *repeat motif*.

We selected 24 elements out of the 50 and qualitatively condensed the scorings from the six coders to a single “consensus” fuzzy set representation of the targets. That is, if the consensus on a given element contained no “outliers,” then the mean value to the nearest 0.1, was used. If there were one or more outliers, the first author re-examined the target and made a decision as to the best value for that element. These 24 elements were selected on the basis of extensive experience as well as upon the formal analysis of a single study (May, Lantz, and Piantineda, 1996). The formal analysis was based on the quantitative information, as measured by standard information theory that was contained in each of 10 levels, which were described by Mat, et al. (1990). From this analysis, the principal criterion used in the current selection was that the elements should not be too “low-level” such as *lines* and *geometric shapes*, nor should they be too “high-level” such as *office buildings*. These 24 were an attempt to strike a compromise between these two extremes. Table 2 shows the 24 elements that comprised the final fuzzy set USE.

Table 2. Universal Set of Elements

Universal Set of Elements		
Buildings	Coliseums	Glaciers/Ice/Snow
Villages/Towns/Cities	Hills/Cliffs/Valleys	Vegetation
Ruins	Mountains	Deserts
Roads	Land/Water Interface	Natural
Pyramids	Lakes/Ponds	Manmade
Windmills	Rivers/Streams	Prominent/Central
Lighthouses	Coastlines	Textured
Bridges	Waterfalls	Repeat Motif

Instructions to the Independent Coders

What follows is the exact wording that was sent to the independent coders:

Thank you for helping with the consensus coding of our new 300-fold target set. We hope that this pool, which will eventually find its way to a CD-ROM, will be of general use.

We have identified 50 descriptors that serve as the Universal Set of Elements (USE). These were determined from three factors.

1. Based on 1000's of remote viewing trials, we have a real good idea of what is and is not likely to be part of an AC response (e.g., no padlock combinations).
2. Items were taken from an earlier USE on similar targets that were experimentally shown to be helpful in blind judging. Thus a lot of the low-level elements in our original USE have been dropped here.
3. The descriptor list does not contain items that are not in THIS target pool.

All elements are to be coded by what is visible in the scene and not from what is implied, but not visible. For example, a view of the Grand Canyon that does not explicitly show the river, must have zero for water bits.

Each element is to be coded with regard to the degree to which it is visually impacting in the scene. Often this is related to the relative area that element occupies; however, it is not exclusively so. For example, a relatively small barn might be visually impacting because it is bright red and your eye is drawn to it.

Elements that appear to be opposites (e.g., urban and rural) should be coded as independent items, and they do not have to sum to one.

The USE appears to have a natural hierarchy to the items (e.g., Land/Water Interface and Rivers). To the best of your ability, code these as independent. For example the land/water interface element might be 0.3 visually impacting and you can clearly see that it is a river (as opposed to a coast), then perhaps the river element would also be coded as 0.3.

Part of this exercise is to see how independent coders address some of the built-in ambiguities, so I will not go further in instructing how fill out the list. Thanks.

Example of the Success of the Fuzzy Consensus Encoding

Based upon the consensus coding of the six contributors, we computed the normalized distance between all possible pairs of target images within each Group. We then used cluster analysis to determine whether targets were closer together within a Category than to other targets within the Group. The distance between targets j and k is given by:

$$d_{j,k} = 1 - \frac{\sum_{i=1}^N \min(\mu_{i,j}, \mu_{i,k})}{\sqrt{\sum_{i=1}^N \mu_{i,j} \times \sum_{i=1}^N \mu_{i,k}}},$$

where N is the number of elements in the USE (i.e., 24 in this case), and the μ 's are the fuzzy set membership values for the respective targets j and k .

Figure 2 shows a dendrite plot of the target images within Group 1:

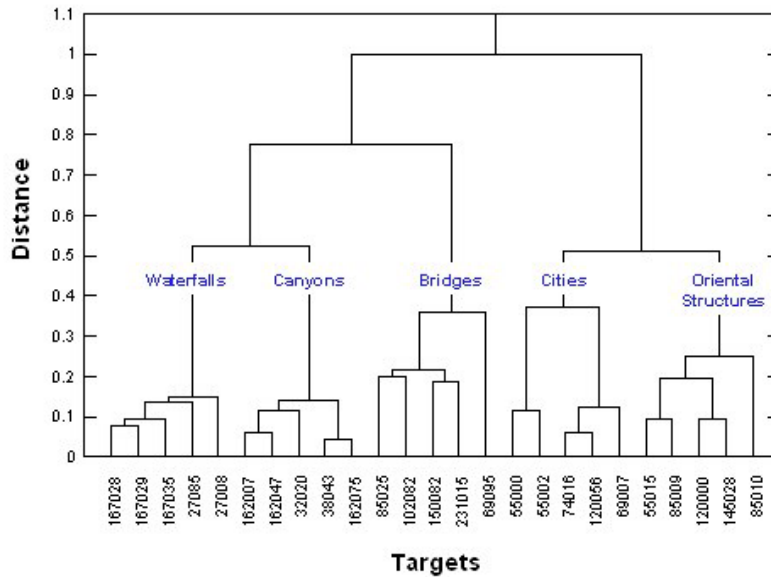


Figure 2. Cluster Diagram for Group 1

The targets within *Waterfalls* and *Canyons* are slightly more self-consistent than those targets in the *Cities* Category. Yet, the clustering shows a clear separation of targets between Categories.

The remaining Groups produce similar cluster diagrams. Thus, we conclude that the targets within a Group are reasonably orthogonal and the fuzzy-set representation of the targets is reasonably descriptive of the photograph.

Target Database

Based upon the 300 target images, we constructed an Access 97 database that contains all the information with regard to this target pool. Figure 3 shows the relationship diagram from the database:

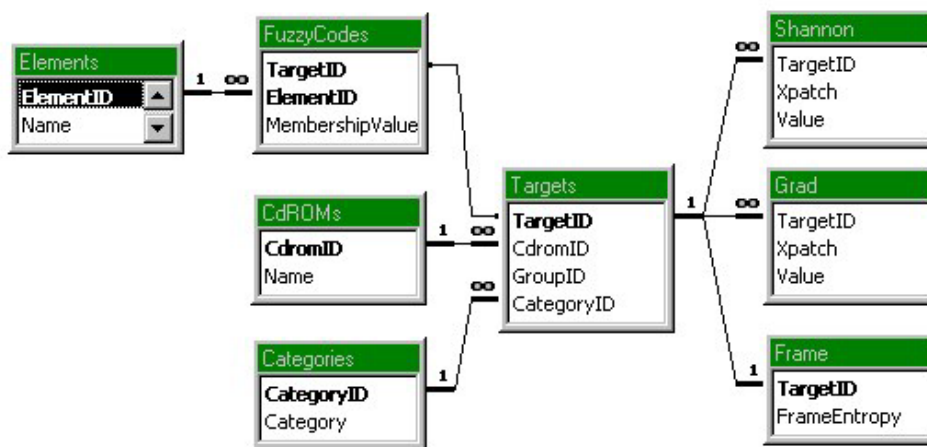


Figure 3. Scheme for Targets Database

The database tables *Shannon* and *Grad* contain the average Shannon entropy and its associated average spatial gradient as a function of patch size in pixels, X_{patch} , respectively. The table *Frame* contains the Shannon entropy for the full image (May, Spottiswoode, and James, 1994). The table *FuzzyCodes* contains the consensus values that were discussed above.

Discussion and Conclusion

We have constructed a target pool of 300 digital image for use in anomalous cognition experiments. One feature of this set is that it is possible to conduct a trial in which no judging decoy set of photographs exist at the time of the session. The decoys can be generated later just prior to the analysis. To choose a target, a Group is randomly selected on the closed interval [1,12]; a Category is randomly selected on the closed interval [1,5]; and finally a photograph with the Category is selected on the closed interval [1,5]. Decoys are generated by randomly selecting a photograph from each of the remaining four Categories from the selected Group for the trial.

By not determining the decoy set in advance of the trial, it is possible to examine such issues of intra-judge consistency where different judges can be given the same decoy set as the original analyst or a different set.

We are planning to produce a CD-ROM with the database and target pool for distribution, at cost, to interested researchers.

References

- May, E. C., Utts, J. M., Humphrey, B. S., Luke, W. L. W., Frivold, T. J., and Trask, V. V. (1990). Advances in Remote-Viewing Analysis. *Journal of Parapsychology*, **54**, 193-228.
- May, E. C., Spottiswoode, S. J. P, and James, C. L. (1994). Shannon Entropy: A Possible Intrinsic Target Property. *Journal of Parapsychology*, **58**, 4, 384-401.
- May, E. C., Lantz, N. D., and Piantineda, T. (1996). Feedback Considerations in Anomalous Cognition Experiments. *Journal of Parapsychology*, **60**, 3, 211-226.