Note that **anova1** assumes that there is an equal number of observations in each sample. For more generalized ANOVAs or unequal samples, see **anova2** or **anovan**. Their syntax is very similar. This, however, should not be necessary for the following project.

7.4 PROJECT

For this project, your task is to replicate a generalized version of the Posner paradigm. In essence, you will measure the speed of the “attentional spotlight” in the vertical versus horizontal directions. You need to create a program that allows you to gather data on reaction times in the Posner paradigm as described in the preceding sections. Most of the particular implementation is up to you (the nature of the cue, specific distances, etc.). However, be sure to implement the following:

- Cue and target must appear in one of 16 possible positions. See, for example, Figure 7.4.
- Make sure you have an equal number of valid and invalid trials. [If the trial is valid, the target should appear in the position of the cue. If the trial is invalid, the target position should be picked randomly (minus 1, the position of the cue).]
- Choose two temporal delays between cue and target: 100 ms and 300 ms. Make the delay an experimental condition.
- Collect data from 80 trials per spatial location of the cue (so that you have 20 for each combination of conditions: Valid/invalid, delay1/delay2). This makes for a total of 1280 trials. But they will go very, very quickly in this paradigm.
- Make sure that the picking of condition (valid/invalid, delay1/delay2, spatial location of cue) is random.
- After collecting the data, answer the following questions:
  1. Is there a difference in reaction times for valid versus invalid trials? (t-test)
  2. Is there a difference in reaction times for different delays? (t-test)
  3. Does the distance between target and cue matter? For this, use only invalid trials and plot reaction time as a function of
     a. Total distance of cue and target

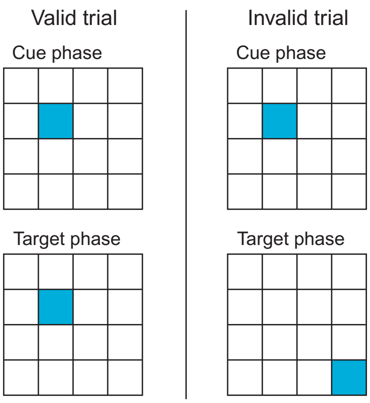

FIGURE 7.4 Valid and invalid trials.

   b. Horizontal distance of cue and target
   c. Vertical distance of cue and target
4. Related to this: Is there a qualitative difference in the slope of these lines? Is the scanner faster in one dimension than the other?
5. What is the speed of the attentional scanner? How many (unit of your choice, could be inches) does it shift per millisecond?

- Implement the project in MATLAB and answer the preceding questions. Illustrate with figures where appropriate.
- ***If you are adventurous**: Use **anova2** or **anovan** to look for interaction effects between type of trial (valid/invalid, delay and spatial location of cue).

Hints:

- Start writing one trial and make sure it works properly.
- Be aware that you effectively have an experimental design with three factors: Cue position (16 levels), trial type (2 levels), and temporal delay (2 levels). However, you can break it up into four factors: Horizontal cue position (4 levels), Vertical cue position (4 levels), trial type (2 levels), and temporal delay (2 levels), which will make it easier to assess the x- versus y-speed of the scanner.
- If you can't produce a proper cue, try reviewing object handles (in figures).
- Write a big loop that goes through trials. Do this at the very end, if individual trials work.
- If you can't do everything, focus on subgoals. Implement one function after the other. Start with two conditions. If you are not able to implement all eight conditions, try to get as far as you can.

MATLAB FUNCTIONS, COMMANDS, AND OPERATORS COVERED IN THIS CHAPTER

randstream
rectangle
ttest2
state
clock
anova1