

# HVCA - Exercise 1

March 23, 2017

Deadline: April 10, 2016

1. Consider a vertical line  $l_1$  that is moving up and to the right with velocity  $v_1 = (5, 3)$  and a horizontal line  $l_2$  that is moving down and to the right with velocity  $v_2 = (1, -2)$ . Plot the velocity vectors, the constraint lines corresponding to the two lines and indicate (both graphically and numerically) the intersection of constraints velocity and the vector average velocity.
2. Given two lines,  $l_1, l_2$  with orientations  $\theta_1, \theta_2$  and velocities  $v_1, v_2$ . Give an analytical equation for the intersection of constraints and vector average velocities. Solve all the way.
3. Give an analytical equation for the velocity of the intersection formed between a moving line  $l_1$  with orientation  $\theta_1$  and velocity  $v$ , and a static line  $l_2$  with orientation  $\theta_2$ . Solve all the way.
4. Consider the vector sum rule. Given two lines with normal velocities  $v_1, v_2$  this rule computes the pattern velocity as  $v = v_1 + v_2$ . Design an experiment to test whether this rule is used by human observers. Do any of the stimuli discussed in the lecture contradict this rule? Compare with IOC and VA. Give a numerical example that demonstrates the differences between the different rules.
5. Propose a different rule (for the perceived velocity of two moving lines) that makes sense to you. Design experiments to differentiate this rule from IOC and VA.