Experiment Plan:

- First week (7/13∼7/16):
  For the first few days, measurements should cover the largest area possible (in the horizontal and in the vertical) so as to get good data coverage and good engineering tests. This could be carried out jointly with the bathymetric survey. Doing some CTD calibration between the Leonardo and the AUV would also be very useful (run some AUV yoyos at the same time and place that the ship CTD profiles). For the AUV yoyo pattern, on the first few days, our suggestion is to maximize the vertical extent (from the surface to the deepest possible). To reach this objective, parameters 'points' and 'threshold' in the yoyo control code should be equal to 30 and 1000 respectively (just call: `yoyo.Initialize(3, 80, 30, 1000)`). Those data will be objectively analyzed and given as input to AREA and HOPS/ESSE. Sufficiently wide area data coverage is limited (Alliance is north of Elba). Ocean forecasts may not be carried out in the first week.

- Second and third week (7/17∼7/28):

  1. On each day, we will have an forecast ensemble containing the principal estimate and n different realizations for the FAF'05 area on the next day. Moreover, we will also have the associated SVP error field and SVP correlation length in horizontal and vertical direction.
  2. We take one scenario from the forecast ensemble.
  3. Implement the ith yoyo pattern in that scenario with adding simulated CTD noise (white). Obtain a sequence of in-situ measurement results.
  4. Do objective analysis based on the in-situ measurement results, SVP error field, SVP correlation lengths, and CTD noise. Obtain a new SVP principal estimate and SVP error field, based on which we can generate another nowcast ensemble.
  5. Calculate TL for each scenario in the nowcast ensemble. Calculate TL uncertainty.
  6. Repeat from the 3rd step for m times (m=10).
  7. Repeat from the 2nd step with choosing another scenario. Calculate sample mean of TL uncertainty for the ith yoyo pattern.
  8. Repeat from the 2nd step with the i+1th yoyo pattern. In the end, find the jth yoyo pattern which has the minimum sample mean of TL uncertainty. See Figure 2, 3.

  After we find the optimal yoyo control pattern, the corresponding optimal parameters will be sent to Pianosa. On the next day, AUV will follow the yoyo control with the optimal parameters and do in-situ measurement. At evening of the next day, in-situ measurement data will be sent back to Cambridge. HOPS/ESSE will be run to generate a forecast ensemble containing principal estimate and n different realizations for the day after.

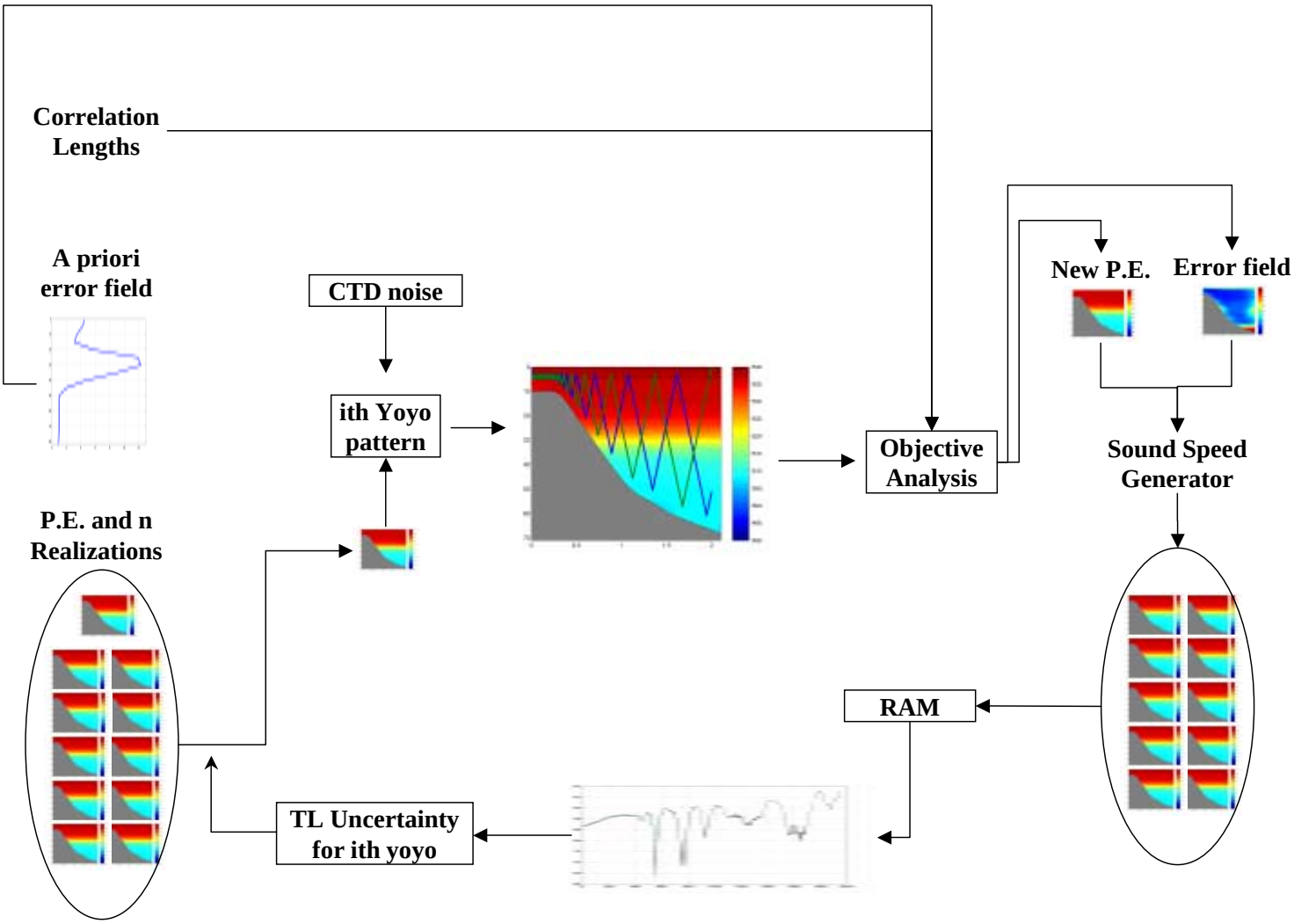

Figure 2: Step 2, 3, 4, 5.

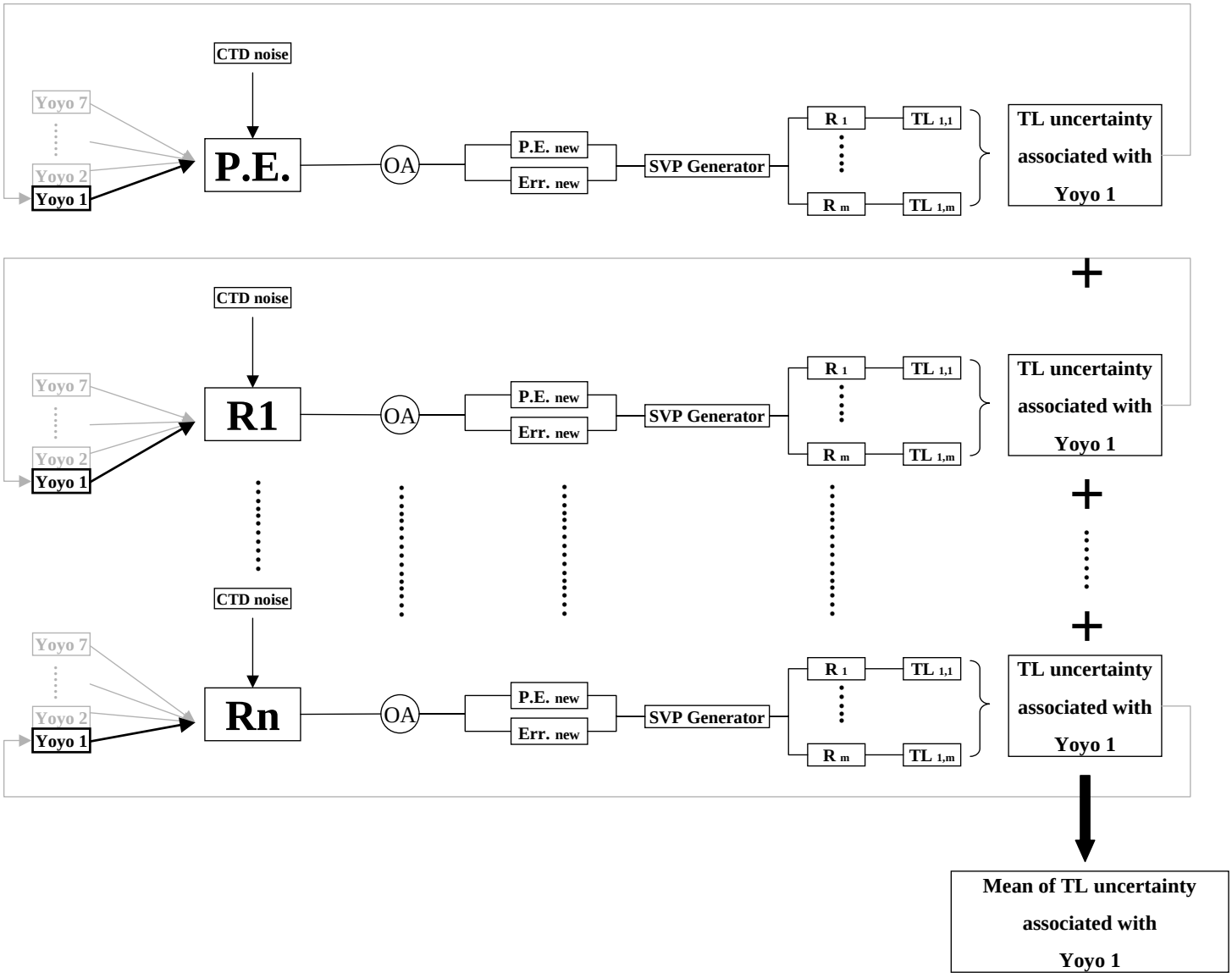

Figure 3: Wiring diagram