



Greatest Young Systems Engineers of the Year Challenge 2015 (GYSEOY 2015)

The mission of the Cancer Catcher system is the early detection of colorectal cancer.

One of the biggest challenges faced by the medical profession with regards to colorectal cancer is how rapidly it takes hold and metastasises. By the time colorectal cancer is detected, it may already be too late. Currently the only sure way of diagnosing colorectal cancer is with a biopsy. The goal is not to eliminate this, but rather to find a way to test for the possible presence of colorectal cancer that will then justify a biopsy.

People above age 50 are advised to have colonoscopies every 5-10 years, except if they have a family history of colorectal cancer in which case they are advised to start screening earlier and have colonoscopies more frequently. This is exactly because of how quickly colorectal cancer can take hold, but colorectal cancer is not only the problem of the geriatric! People younger than 50 are also at risk and they simply don't get regular colonoscopies. For instance people with a family history of hereditary nonpolyposis colon cancer are advised to get colonoscopies every 1-2 years starting at age 20 to 25! Once colorectal cancer has metastasized, the five year survival rate is 12.9% as opposed to 89.8% five year survival rate if the cancer is localized when diagnosed. This is a very good incentive to catch it early!

Your diagnostic system must preferably be non-invasive and make economic sense. It must be feasible and based on mature technology. This isn't a R&D exercise but rather a Systems Engineering exercise.

The four most widely used screening tests are:

- High sensitivity faecal occult blood tests (FOBT),
- Sigmoidoscopy,
- Colonoscopy,
- Double contrast barium enema.

A faecal occult blood test mainly detects colorectal cancer, whereas the other tests also detect colorectal polyps (which in time may become cancerous). These are the tests your solution will be competing against.