



Maryland All-Sky Network: Optimization and Expansion



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Science, Discovery, and the Universe

Issue

For this project we worked with the University of Maryland Observatory to continue development of the All Sky network. The network uses a program called Astride to detect streaks in the night sky. So far the network consists of 1 Starlight Xpress Oculus camera, taking photographs with exposure times between 25 and 55 seconds depending on light conditions. Some of the issues were that while the Astride program does a good job detecting streaks, it also often encounters false positives, and occasionally fails to detect certain streaks. In addition, while the streak detection software is well developed, it was lacking in user functionality, and lacked an effective means of distributing the processed data.



Unprocessed Meteor Exposure



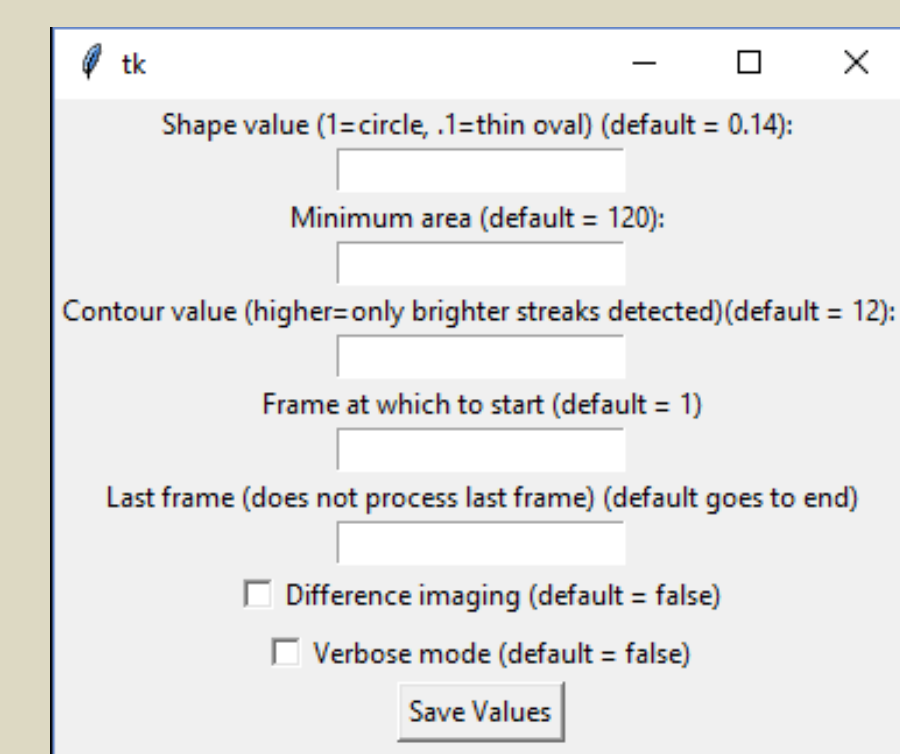
ASTRIDE Streak Detection

```
280 ffs = glob.glob(arguments.file_pathin+'/*.*') + glob.glob(arguments.file_pathin+'/*.*') + \
281 glob.glob(arguments.file_pathin+'/*.*') + glob.glob(arguments.file_pathin+'/*.*') + \
282 glob.glob(arguments.file_pathin+'/*.*') + glob.glob(arguments.file_pathin+'/*.*')
283 ffs = list(set(ffs))
284 ffs.sort()
285 # on linux wasn't sorted, on dos it was
286 f = open(arguments.file_pathout+'summary.txt','w') # Creates summary text file
287 f.write('Streaks found in files: \n') # creates first line for summary file
288
289 sf = arguments.start_frame
290 ef = arguments.end_frame
291
292 if sf == 0:
293     sf = 1
294
295 if ef == 0 or ef > len(ffs):
296     ef = len(ffs)
297
298 if ef < sf:
299     temp = sf
300     sf = ef
301     ef = temp
302
303 print('Processing %d files from %d to %d % (ef=%s), sf, ef)')
304 for ff in ffs[sf-1:ef]:
305     # creates directory one directory back from the folder which contains fits files
306     num = do_one(ff,arguments.file_pathout+'%ff(ff,rfind(os.sep)+1:ff,rfind('.')).',arguments.shape,arguments.area,arguments.contour)
307
308 if num == 0:
309     zero_image += 1
310 elif num < 0:
311     bad_image += 1
312     bad_image_paths.append(ff)
313 else:
314     detected += int(num) #Counter of how many streaks detected
315     fileCount += 1 #Counter for how many files analyzed
316
317 print('\n')
318 # Promote and write summary file
319 f.write('\n')
320 f.write('Files analyzed: ' + str(fileCount) + '\n')
321 f.write('Streaks detected: ' + str(detected) + '\n')
322 f.write('Files with no detections: ' + str(zero_image) + '\n')
323 f.write('Bad files: ' + str(bad_image) + '\n')
324
325 temp_string = '\n'
326 temp_string = temp_string.join(bad_image_paths)
327 f.write(temp_string)
328 f.write('\n')
```

Portion of try_astride.py

Activities

Our main additions to the ASTRIDE software were in adding more user options, such as optional difference images, a verbose mode, and allowing a user to process subsets of the whole data. This is useful because a whole night of data can contain upwards of 1400 files. In addition we developed a GUI as another option for users. Finally, we developed a set of programs to parse the data output and format it into tables that can then be presented on a website that we made.



GUI feature implementation

Impact

Through our work, we've been able to further improve the ASTRIDE software and provide a more complete package. For us, this has been a valuable learning experience in furthering our programming skills, and introducing us to software development. In particular, we strengthened our skills in Python and learned HTML and CSS as well. This really helped us develop our confidence in Python in particular. We also became more familiar with the use of Github to organize our work in a team project. In addition, work on this project also inspired a greater interest in astronomy and the role of programming in astronomy, leading Zach to begin on an Astronomy minor.

Future Work

There is still work to be done in making a complete software package. Given more time, we would like to further improve the design and organization of our website for presenting the processed data. There is also still work to be done in further automating the program, like for example creating an automated database for satellite flyovers. In addition, there is still work to be done in optimizing Astride's streak detection. For Zach, this project resulted in more interest in exploring programming careers in astronomy. For Dmitriy, the programming experience of the project resulted in a greater interest in autonomous systems.

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