Summer undergraduate research program, 2023

Searching for Dwarf Galaxy Candidates in NGC3621

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1. Intro

The search of dwarf galaxy candidates is gradually being expanded as more results are being published. These dwarf galaxies are smaller galaxies with loose to no structure that orbit about larger galaxies, and are able to provide insight to their host. We conduct our search in the field of NGC3621 roughly 2°x2°, broken up into two sub-fields in the BVI bands taken by the Korea Microlensing Telescope Network (KMTNet).

2. Initial detection

Sub-fields were inspected by eye by four individuals first, then results were compared and discussed in search of ideal candidates. Ideal candidates were large (about 20 pixels diameter) and diffuse/irregular.

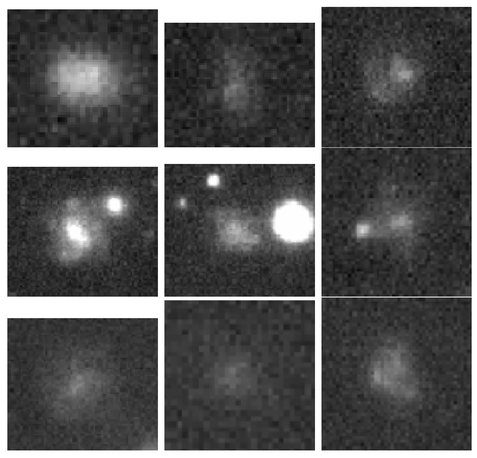

Figure 1: Sample dwarf galaxy candidates.

Semi-finalized list of both sub-fields has been produced with promising results.

3. Analysis on Dwarf Galaxy Candidates (DGCs)

3.1 Elliptical model fitting

We work primarily with the Python library Photutils in conducting the analysis in the DGCs. We place the constraint on the candiates that they must be elliptical in nature and diffuse in order for the fitting to work. We choose an initial guess and create concentric ellipses about the center of the candidate radially outward to generate isophotes by fitting the ellipses to each image. Each candidate then is left with its respective isolist, which contains each of the parameters for the DGC. We then build models of the candidates.

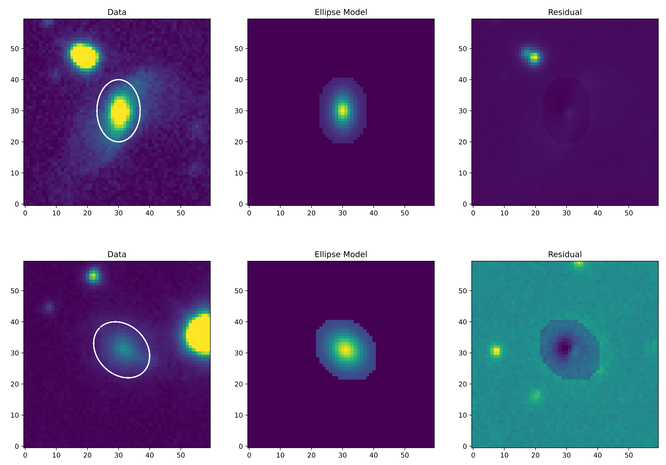

Figure 2: Models of DGCs in I band. B and V bands were generated using the information from the I band fitting.

3.2 Intensity profiles and Sérsic function

The Sérsic function is an exponential function used to fit the radial profile of the DGCs. It is $\mu_I = \mu_{0,I} + (r/r_{0,I})^{1/n_I}$, where μ_I, $\mu_{0,I}$, r, $r_{0,I}$, n_I are the surface brightness, central surface brightness, radius, scale length, and Sérsic index. We fit both the intensity profiles and magnitudes using the Sérsic to extract parameters from each of the DGCs.

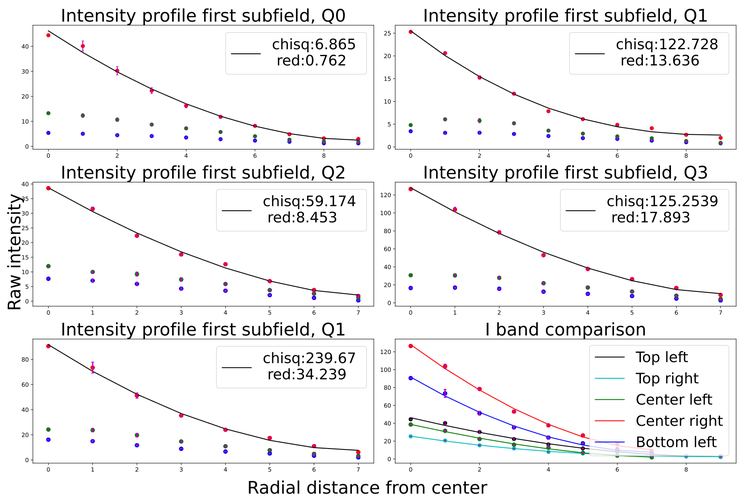

Figure 3: Radial intensity profiles of several DGCs from isophote fitting. We fit the Sérsic function to them to model the behaviour.

In order to fit the profiles, we use a least squares fitting on the data. We calculate magnitudes using the raw flux of the DGCs with $m = -2.5\log(F/0.16)$ where m and I is the magnitude and raw flux. Division by 0.16 is to ensure the units work

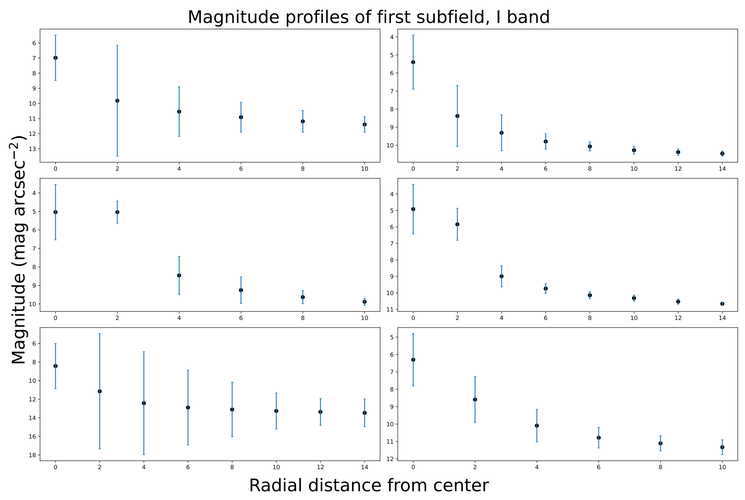

Figure 4: Magnitude profiles of several DGCs from isophote fitting.

4. Conclusions

Expanding the search for DGCs about host galaxies will help us infer information about their host, and decreasing the gap in knowledge will help future surveys and projects. We conducted our survey in the field of NGC3621, a large field spiral galaxy approximately 6.7Mpc away. Having a host galaxy so close allowed for a close look at the field and the potential candidates. We have a total list of approximately 170 objects, with about 72 promising candidates.

References

[1] Tony Junjing Fan, Dae-Sik Moon, Hong Soo Park, Dennis Zaritsky, Sang Chul Kim, Youngdae Lee, Ting S. Li, Yuan Qi Ni, Jeehye Shin, Sang-Mok Cha, and Yongseok Lee. Dwarf galaxy discoveries from the kmtnet supernova program iii. the milky-way analog ngc 2997 group, 2023.