the depression of the *G*-band of CH (λ4305) relative to the local continuum, the β-index, which samples the strength of the Hβ Balmer line of hydrogen relative to the surrounding continuum, and the *KHG*-index of Brigham Young University (McNamara & Potter 1969; McNamara, Helm, & Wilcken 1970; Feltz 1972), which measures the strengths of Ca II K (λ3933), Balmer Hδ (λ4101), and the *G*-band through narrow band interference filters in a manner independent of extinction. A more recent technique (Sasselov & Lester 1990) involves the use of line depth ratios between C I and Si II lying on the Brackett continuum near 10728 Å. A similar technique was used by Krockenberger et al. (1998) using spectral lines falling in the red region of Cepheid spectra. Kovtyukh et al. (2008) have taken the technique to its ultimate level of sophistication by using high resolution optical spectra of Cepheids throughout their cycles, in conjunction with stellar atmosphere models, to track their changes in effective temperature, and thus intrinsic broad band color.

The use of close neighbours to deduce reddenings for Cepheids appears to date from its application to the blue companion of δ Cep by Eggen (1951); it has also been used recently for Cepheids studied with the *Hubble Space Telescope* (Benedict et al. 2007). But the existing sample includes only ∼40 Cepheids of known space reddening (Laney & Caldwell 2007). This study presents new space reddenings for 15 Galactic Cepheids derived from CCD $BV(RI)_C$ photometry for stars in the immediate fields of the variables. The goal is to test the feasibility of deriving Cepheid reddenings based upon only $BV(RI)_C$ observations for stars in the fields of the Cepheids, as well as to augment the limited sample of Cepheids with space reddenings. As demonstrated here, the methodology appears to provide useful results that extend the sample of Cepheids with independently derived reddenings.

2. OBSERVATIONAL DATA

The input data for the present study consist of observations of 15 Cepheid fields obtained with the 1.0 m Ritchey-Chrétien telescope of the U.S. Naval Observatory, Flagstaff Station. A Tektronix/SITe, 1024 × 1024 pixel, thinned CCD was used with Johnson system *BV* and Kron-Cousins system $(RI)_C$ filters to image the fields (e.g., Henden & Munari 2000). Several deep images were obtained for each field, from which average $BV(RI)_C$ magnitudes and colors, with typical uncertainties smaller than $\pm 0^m.01$, were extracted for all detectable stars using DAOPHOT (Stetson 1987). Since no *U*-band observations or spectral types are available for the stars in the survey fields, it was necessary to deduce individual reddenings from photometric analyses of two-color diagrams constructed from the $BV(RI)_C$ data. The data are available electronically from A.A.H. via ftp from the American Association of Variable Star Observers website[5].

An often-ignored feature of interstellar reddening is that no single relationship accurately describes it over all regions of the Galaxy (Wampler 1961, 1962; Mathis 1990; Turner 1976a,b, 1989, 1994). Regional variations in the reddening law depend directly upon direction viewed through the Milky Way, vary slowly with Galactic longitude, and are tied to differences in the distribution of particle sizes for dust lying along different lines of sight. The resulting Galactic longitude and latitude dependence of the extinction law affects interstellar reddening studies that implicitly use a relationship of fixed parameterization to describe the extinction in a particular color system, and should be most important for stars of large reddening. Several of the Cepheids in the present sample are heavily reddened, so the extinction laws for the fields of each object were established prior to the analysis by taking advantage of existing studies for regions reasonably close to the program objects (e.g., Johnson 1968; Turner 1976b, 1989, as well as other published studies by the lead author).

Specifically, a reddening slope E_{U-B}/E_{B-V} for the field of each program Cepheid was established from studies by Turner (1976b, 1989) for adjacent regions, and was linked to specific reddening slopes E_{V-I}/E_{B-V} and E_{R-I}/E_{B-V} on the Johnson system using regional reddening curves from Johnson (1968). Those were then converted to reddening slopes E_{V-I}/E_{B-V} and E_{R-I}/E_{B-V} on the Kron-Cousins system using the results of Fernie (1983) and Caldwell et al. (1993). To illustrate the methodology, the results for specific fields studied by Johnson (1968) and exhibiting a range of color excess ratios E_{U-B}/E_{B-V} are shown in Figure 1, where it can be noted that the *I*–band E_{V-I}/E_{B-V} reddening ratios appear to display no significant dependence on visible reddening slope E_{U-B}/E_{B-V}. The Cepheids studied here all lie in fields where the reddening slope does not vary significantly from the locally observed Galactic mean, so specifying the exact reddening ratio for each field proved to be only a minor concern.

3. METHOD OF ANALYSIS

This study presents new space reddenings for 15 Galactic Cepheids derived from two-color dia-

[5] ftp://www.aavso.org/public/calib/.